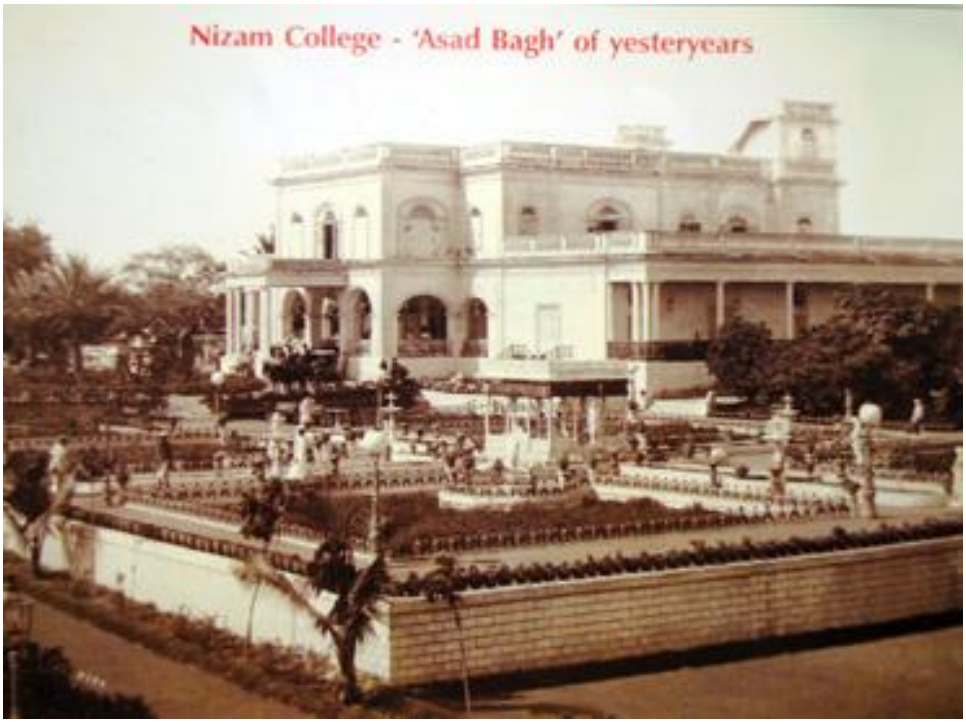
EAPCET
MATHEMATICS

Volume I & II



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MATHEMATICS

Volume I & II

By

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(Engineering, Agriculture & Medicine Common Entrance Test)

MATHEMATICS

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PREFACE

Taking competitive examinations has became the order of the day for any educated young man who is desirous of seeking any coveted job, a seat in any prestigious college. The approach required for such competitive examination is different from that of taking an academic examination.

It was observed that most of the minority candidates do not fare well at these competitive examinations not because they lack in talents but because they can neither afford to join the private coaching centres nor could purchase the required study material.

In order to improve the participation and performance of the candidates belonging to minorities in such competitive examinations, the Minorities Welfare Department, State Government sponsored a project to Osmania University. The University in turn established Centre for Educational Development of Minorities (CEDM) in 1994 in Nizam College. Since then, the Centre has been offering free coaching for the benefit of candidates belonging to minority communities appearing for various job seeking and admission seeking competitive examinations at Hyderabad and other minority concentrated districts of the state. In respect of job-seeking examinations, the Centre is providing free coaching and study material for TS TRT, TS TET etc. and for admission oriented examinations such as NEET, EAPCET, ICET, ECET, EdCET, DEECET and POLYCET etc. In addition to these coaching programmes, the Centre is also providing free coaching and study material to X class Urdu medium minority students in minority concentrated districts of the state to strengthen their educational foundation and to improve their performance in SSC Public Examination.

We wish to place on record the pains the compilers have taken to summarize and arrange the important questions. The Centre gratefully acknowledges their services.

If these study materials are of any help to the candidates, we feel immensely rewarded for the humble efforts we have put in.

Hyderabad
April 2024

Prof. S. A. Shukoor,
DIRECTOR

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I YEAR

1. FUNCTIONS

IMPOTANT POINTS, FORUMLAE AND SHORTCUTS

1. FUNCTION: A relation f: A→B is said to be a function if every element of set A have unique image in set B.

   Types of Functions:

2. INTO FUNCTION : A function f :A→B is said to be an into function if atleast one element of set B does not have pre-image in set A.
3. ONE-ONE FUNCTION: A function f :A→B is said to be a 1-1 function if distinct elements of set A have distinct images in set B. It is also known as injection.
   i) For a 1-1 function if f(x)=f(y) then x=y
   ii) For a 1-1 function n(A)≤n(B)
4. ONTO FUNCTION: A function f :A→B is said to be an onto function if all the elements of set B have pre-images in set A. It is also known as surjection.
   i) For an onto function f (A)=B.
   ii) For an onto function n(A)≥ n(B).
   iii) If A , B are two finite sets and n(B) =2, then the number of onto functions that can be defined from A onto B is $2^{n(A)} - 2$.
5. BIJECTION:A function f :A→B is said to be bijection if it is 1-1 and onto. If A,B are two finite sets and f:A→B is bijection, then n(A)= n(B).
6. COMPOSITE FUNCTION: If f:A→B, g:B→C are two functions then gof:A→C defined by (gof)(x)=g[f(x)] for all x€A is known as composite function.
7. CONSTANT FUNCTION:A function f :A→B is said to be a constant function if all the elements of set A have same image in set B. The range of a constant function always consists of only one element.
8. IDENTITY FUNCTION: A function I:A→A is said to be an identity function if the element and its image are equal,
   i) for an identity function. I(x)=x
   ii) Identity function is always a Bijection.
9. INVERSE FUNCTION: A function f:A→B will have its inverse function f^{-1}:B→A if f isa bijection.
10. REAL VARIABLE FUNCTION: A function is said to be a real variable function if its domain belongs to set of real numbers.
11. REAL VALUED FUNCTION: A function is said to be a real valued function if its co- domain belongs to set of real numbers.
12. REAL FUNCTION: A function is said to be a real function if its domain and co-domain both belong to set of real numbers.
13. EVEN FUNCTION: If f(-x) = f(x) then f(x) is known as even function.
14. ODD FUNCTION: If f(-x) =- f(x) then f(x) is known as odd function.
15. If A,B are two finite sets, then the number of functions that can be defined from A to B are $n(B)^{n(A)}$.
16. If A,B are two finite sets, then the number of functions that can be defined from B to A are $n(A)^{n(B)}$.

17. The number of constant functions from A to B are n (B).
18. The number of one-one functions that can be defined from A to B is $n(B)p_{n(A)}$
19. The number of one-one functions that can be defined from a finite set A into a finite set B is $n(B)p_{n(A)}$ if n(B) >n(A) and 0 if n(B) <n(A).
20. If A,B are two finite sets and n(A)= n(B) then the number of onto functions that can be defined from A onto B is n(A)!
21. If A,B are two sets then the number of onto functions that can be defined from A toBare $n(B)^{n(A)} - \{n(B)c_1[n(B)-1]^{n(A)}$ $-n(B)_{c_2}[n(B)-2]^{n(A)} + n(B)_{c_3}[n(B)-3]^{n(A)} - -\}$
22. If A,B are two finite sets and n(A)= n(B) then the number of bijections that can be defined from A onto B is n(A)!
23. If (x-a)(x-b) <0 $\Rightarrow x \in (a,b)$
24. If (x-a)(x-b) ≤0 $\Rightarrow x \in [a,b]$
25. If (x-a)(x-b) >0 $\Rightarrow x \notin (a,b)$
26. If (x-a)(x-b) ≥0 $\Rightarrow x \notin [a,b]$
27. a) If $a^2-x^2 \geq 0 \Rightarrow x^2-a^2 \leq 0 \Rightarrow (x+a)(x-a) \leq 0 \Rightarrow x \in [-a,a]$
    b) If $a^2-x^2 > 0 \Rightarrow x^2-a^2 < 0 \Rightarrow (x+a)(x-a) < 0 \Rightarrow x \in (-a,a)$
28. a) If f(x)=ax+b then $f^{-1}(x)= (x-b)/a$
    b) If $f(x)=\frac{ax+b}{cx+d}$ then $f^{-1}(x)= \frac{-(b-dx)}{a-cx}$
29. If $f(x)=\sqrt{\frac{x-a}{x-b}}$ then domain=R-(a,b] if a<b
    =R-[b,a) if a>b
30. If $f(x)= \sqrt{\frac{x-a}{b-x}}$ then domain=[a,b) if a<b
    =(b,a] if a>b
31. If $x \in R$, then the modulus or the absolute value of 'x' is denoted by |x| and is defined as follows:
    if x>0 then |x|= x
    if x<0 then |x|= -x
    if x=0 then |x|= 0
32. If f(x)=ax+b (Linear factor) then f : R→R is a bijection.
33. If f(x) is a polynomial function such that f(x).f(1/x) = f(x) +f(1/x) then f(x) = x^n+1 or $-x^n+1$
34. If $f(x) = \frac{ax+b}{cx-a}$ then fof(x)=x
35. The domain of $\sqrt{a^2-x^2}$ is [-a,a].
36. Domain of $\sqrt{x^2-a^2}$ is $(-\infty,a] \cup [a,\infty)$

37. Domain of $\sqrt{(x-a)(b-x)}$) where a <b is [a,b]

38. Domain of $\sqrt{(x-a)(x-b)}$ where a<b is (-∞,a] U [b,∞)

39. Domain of $\sqrt{(x-a)/(x-b)}$ when a<b is (-∞,a] U (b, ∞)

40. Domain of $\sqrt{(x-a)/(x-b)}$ when a>b is (-∞,b) U [a,∞)

41. Domain of $\sqrt{(a-x)/(b-x)}$ when a<b is [a,b)

42. Domain of $\sqrt{(a-x) / (b-x)}$ when a> b is (b,a]

43. Domain of log (a^2-x^2) is (-a,a)

44. Domain of log (x^2-a^2) is (-∞,-a) U (a,∞)

45. Domain of log (x-a) (b-x) when a<b is (a,b)

46. Domain of log (x-a) (x-b) when a<b is (-∞,a) U (b,∞).

47. If f(x) = $\frac{|x|}{x}$ | then domain f(x) = R- [0] Range f(x) = {-1,1}.

48. Range of f(x) = a cosx+bsinx +c is [c- $\sqrt{a^2+b^2}$, c+ $\sqrt{a^2+b^2}$].

49. A function 'f' is said to be an odd function if f(-x) = -f(x) ,x∈R in the domain of 'f'.
50. A function 'f' is said to be an even function if f(-x)=f(x) , x∈R in the domain of 'f'.
51. f(x) + f(-x) is an even function.
52. f(x) – f(-x) is an odd function.
53. The product of two even functions is an even function.
54. The product of two odd functions is an even function.
55. The product of an even function by an odd function is an odd function.

EXERCISE-A

1. If f(x)=$\log_9 x$ then $f^{-1}(x)$=_____

   1)9 2)2^x 3)3^x 4)9^x

2. If f(x)=$\log_3 x$ then $f^{-1}(x)$=_____

1)2^x 2)3^x 3)4^x 4)9^x

3. If f(x)=3x-5 then $f^{-1}(x)$=_____
1)x+5 2)x+4 3)(x+5)/3 4)(x+4)/3

4. If f(x)=(2x+1)/3 then $f^{-1}(x)$=_____
1)(3x-1)/2 2)(4x-2)/2 3)3x-1 4)4x-1

5. If f: A→B , f(x) = (2x+5)/3 then $f^{-1}(x)$ = _____
1)2x-5/3 2) 5x-2/3 3) 3/2x+5 4) (3x-5)/2

6. If f(x)=(2x+3)/(5-2x) then $f^{-1}(x)$=_____
1)-{(3-5x)/(2+2x)} 2) {(3-5x)/(2+2x)} 3)(3-5x)(2+2x) 4)-(3-5x)(2+2x)

7. f(x) = 3x+4 /2x-3 then $f^{-1}(x)$ =_____
1) 2x 2) x/2 3) x 4) x^2

8. The inverse of f(x)=$\{4-(x-7)^3\}^{1/5}$=_____
1)$2+(4-x^5)^{1/3}$ 2) $3+(4-x^5)^{1/3}$ 3)$7+(4-x^5)^{1/3}$ 4) $1+(4-x^5)^{1/3}$

9. The inverse of f(x)= $(10^x-10^{-x})/(10^x+10^{-x})$ is
1)$\log_{10}\{(1+x)/(1-x)\}$ 2)1/3 $\log_{10}\{(1+x)/(1-x)\}$
3) (1/2) $\log_{10}\{(1+x)/(1-x)\}$ 4)3 $\log_{10}\{(1+x)/(1-x)\}$

10. If f: R→R , g: R→R are two functions defined by f(x) = 2x-3, g(x) =x^2 then fg=_____
1) $2x^2 - x^3$ 2) $2x^3-3x^2$ 3) x^2-2x^3 4) x^3-2x^2

11. f: R→R is defined by f(x) = x^2 is
1)one – one 2) onto 3) bijection 4) identity

12. f(x) = 3x-2, g(x) =x^2+1, (fof) (x^2+1) =_____
1) $9x^2+1$ 2) $9x^2-1$ 3) $1-9x^2$ 4) x^2+9

13. An inverse function exists when the given function is _____
1)one – one 2) onto 3) both one – one & onto 4) identity

14. A= { 1,2,3} then f= {(1,1) , (2,2), (3,3) } is _____
1) one-one 2) constant 3) exponential 4) identity

15. If A= { -1,0,1,2} and f(x) =2x-3 and f: A→B is an onto function then set B=___
1) {5,3,1,1} 2) {-5,-3,-1,1} 3) {-2,0,2,4} 4) {-2,0,-2,-4}

16. A= {1,2,3,4,5} and f: A $\rightarrow$R f(x) =x^2+x-2 then range of f is _____
1){ 0,4,10,18,28} 2) {4,10,18,28} 3) {0,2,5,9,14} 4) {0,4,10,14}

17. If f(x)=tanx then f(x+y)=_____
1) f(x)f(y) 2)[f(x)+f(y)]/[1-f(x)f(y)]
3) f(x)f(y)/1+f(x)f(y) 4)f(x)

18. The function f(x) = $2x^4$ -$6x^2$+9 defined on R is
1) even function 2) odd function 3) Negative function 4) both odd and even

19. If f(x) = 4x-x^2 then f(y+1) – f(y-1) is _____
1) 4-8y 2) 4y-8 3) 8-4y 4) 4+8y

20. A= {a,b,c,d} , B={1,2,3,4} then f= {(a,1), (b,3) , (c,1) (d,2) } is
1) function 2) one – one function 3) onto function 4) both b and c.

21. If A= {1,2,3} , B = {a,b,c,d } f= { (1,a) (2,b) (3,d) } then f is
1) onto 2) constant 3) one one onto 4) one – one

22. If f(x) = a^{2x}-a^{-2x} /a^{2x}+a^{-2x} then f(x) is
1) even 2) odd 3) both even and odd 4) cannot be determined

23. If f: N $\rightarrow$ R + (+ve real numbers) and f(x) = $\sqrt{x}$ then the value of $\frac{f(49)}{f(25)-f(9)}$ =

1)1 2) 7/2 3) $\frac{3}{4}$ 4) 1/3

24. If f= {1,2) (2,-3) (3,-1) } then f^2=
1) {(1,4), (2,9) (3,1)} 2) {(1,4),(1,9),(3,1)} 3) {(1,4), (1,6) , (1,9)} 4) None

25. If f(x) = 3+4x and g(x) =x^2-1 for all real value of 'x' then the value of [go(gof)] (1) =
1)2303 2) 2499 3) 50 4) 48

26. If f and g are real valued function defined by f(x)=2x-1and g(x)=x^2 then the value of 3f-2g is__
1) $2x^2$+6x+3 2) -$2x^2$+6x-3 3) -$2x^2$-6x-3 4) none

27. If f= { (1,5) ,(2,4) ,(3,3), (4,2), (5,1) } then f^{-1} = _____
1) f 2) 2f 3) –f 4) -2f

Note: If f(x) = $\frac{x+1}{x-1}$ then if number of *f* is even its answer is x, and if number of *f* is odd then its answer is *f*(x).

28. If $f(x) = \frac{x+1}{x-1}$ then (f 0f0f)(x)
1)x 2)f(x) 3)x^{-1} 4)x^2

29. If $f(x) = \frac{x+1}{x-1}$ then (f 0f0f0f)(x) = ……
1)x^2 2)1 3)x 4)x^{-1}

30. If f:R→R, g:R→R defined by f(x)=5x-3, g(x)=x^3+3 then (gof^{-1})(3)=_____
1)111 2)591/125 3)25 4)591

31. The no. of mappings that can be defined from a set of four elements into a set of three elements is_____
1)20 2)21 3)31 4)81

32. The number of function that can be defined from B to A when A= $\{x_1,x_2,x_3,x_4\}$ and B = { 5,6,7} is _____
1) 4^3 2) 3^4 3) $3x^4$ 4) $4x^3$

33. Set A has n elements. The number of function that can be defined from A into A is
1)n 2)√n 3)n^n 4) n^2

34. Set A has three elements and B has four elements. The number of 1-1 functions that can be defined from A into B is_____
1)4 2)24 3)44 4)34

35. The number of 1-1 functions that can be defined from A={6,36} to B={1,2,3,4,5} is
1) 20 2) 2 3) 5 4) 6

36. The number of 1-1 functions from A ={4,l8,12,16} to B is 5040 then n(B)=_____
1)10 2)11 3)2 4)9

37. The no. of injections that are possible from A to itself is 720 then n(A)=_____
1)2 2)4 3)5 4)6

38. n(A)=3 ,n(B)=2. Number of onto functions from A onto B is _____
1)2 2)3 3)6 4)5

39. If n≥2 then the number of surjection that can be defined from {1,2,3,-----,n} onto{1,2} is___
1)2^n 2)2^{n}-2 3) 2^{n}+2 4) $2(2^{n})$

40. The number of surjection from set $X=\{x_1,x_2,x_3,x_4,x_5\}$ to set $Y=\{y_1,y_2,y_3,y_4,y_5,y_6\}$
1)zero 2)one 3)more than one 4)none

41. The no. of constant functions from $A=\{a_1,a_2,-----,a_n\}$ to $B=\{b_1,b_2,-----,b_n\}$
1)n^2 2)$\sqrt{n}$ 3)2n 4)n

42. The number of constant functions from A={1,2,3} to B{4,5} is
1)1 2)4 3)2 4)5

43. The number of bijections from set A to itself when A contains 106 elements is [1994]
1)106! 2)$\sqrt{106}$ 3)106 4)202

44. If A={11,12,13,14} and B={6,8,9,10} then the number of bijections from A to B is
1)24 2)20 2)22 3)21

45. The domain of $\sqrt{4-x^2}$ is
1)[2,2l] 2)[-2,-2] 3)[2,-2] 4)[-2,2]

46. If f is a real valued function f(x) = $\sqrt{a^2-x^2}$ then domain =_____
1)(a,-a) 2) [a,-a] 3) [-a,a] 4) (-a,a)

47. The domain of $\sqrt{x^2-16}$ is
1)(-∞,-4]∪[4, ∞) 2)(- ∞,4] ∪ [4, ∞] 3) (- ∞,-4] ∪ [4, ∞] 4)N

48. The domain of $\sqrt{x^2-3x+2}$ is
1) (-∞,1]∪[2,∞) 2)(-∞,1)∪(2,∞) 3)[-∞,1)∪(2,∞] 4)Z

49. The domain of $\dfrac{1}{\sqrt{x^2-3x+2}}$ is
1) [-∞,1)∪(2,∞] 2) (-∞,1]∪[(2,∞) 3) [-∞,1]∪[2,∞] 4) [-∞,1)∪[2,∞)

50. The domain of $\log(a^2-x^2)$ is _____
1) [-a,a] 2) (-a,a) 3)[-a,a) 4)[-a,a)

51. The domain of log(x-2) is
1)(3,∞)2)(2,∞) 3)(4,∞) 4)none

52. Domain of log(x-a)(x-b) is _____
1)[-∞,a]∪[b,∞] 2)(-∞,a)∪(b,∞) 3)(-∞,a)∪(b,∞) 4)[-∞,a]∪[b,∞]

53. Domain of $\log(x^2-5x+6)$ is _____
1)R (set of real numbers) 2)R-[2,3] 3)R-(2,3) 4)Z

54. Domain of $\sqrt{(x-2)}+1/[\log(5-x)]$ is _____
1)[2,4)∪(4,5) 2)[2,4]∪[4,5] 3) (2,4)∪(4,5) 4)(2,4]∪[4,5)

55. The domain of f(x) = $\sqrt{x+2}+\dfrac{1}{\log_{10}(1-x)}$ is_____
1)(-2,0) ∪ (0,1) 2) [-2,0) ∪ (0,1) 3) (-2,0)∪ (0,1] 4) R

56. Range of $\sqrt{x-5}$ is_____
1)(0,∞)2)[0,∞]3)(0,∞]4)[0,∞)

57. Range of $\sqrt{|x|-x}$ is _____
1)[0,∞)2)(0,∞)3)(0,∞]4)[0,∞]

58. Range of 1/(5-sin2x)is _____
1)(1/6,1/4) 2)(1/6,1/4] 3)[1/6,1/4] 4)[1/6,1/4)

59. Range of sin3x+cos3x is _____
1)[-√2,√2] 2)(-√2,√2) 3)(-√2,√2] 4)[-√2,√2)

60. The domain of the function $f(x)=\left[\log_{10}(1-x)\right]^{-1}+\sqrt{x+2}$ is
1) (-∞, 1) 2) [-2, ∞) 3) [-2, 1) 4) [-2, 1) \ {0}

61. If A= {1,2,3} then arrange the following in descending order
a)number of one-one functions from A into A
b)number of identity functions from A into A
c)number of constant functions from A into A
d)number of into functions from A into A
1)d,a,c,b 2)b,c,a,d 3)d,c,b,a 4)d,a,b,c

62. If f(x)=x+4; g(x)=$\frac{x}{2}$+3 then match the following:

I. (fog)(2)	a)7
II. (fof)(-4)	b)4
III. (gof)(4)	c)8
IV.(f^{-1} 0 g^{-1}) (6)	d)0
	e)2

1)c,d,a,b 2)c,b,a,e 3)c,a,e,d 4)c,b,e,d

63. The domain of the function $f(x)=\dfrac{1}{x}+\sin^{-1}x+\dfrac{1}{\sqrt{x+2}}$ is
1) [-1, 1] – {0} 2) [-1, 1] 3) (-1, 0) 4) ϕ

PREVIOUS EAMCET PROBLEMS

64. f(x)=0 x is rational g(x)=-1 x is rational
1 x is irrational =0 x is irrational
(fog)(180) +(gof)(e)=_____ (2001)
1)1 2)-1 3)$\pm$1 4)2

65. If f:Z$\rightarrow$Z and f(x) = x/2 (x is even)
= 0 (x is odd), then f is _____ (2001)
1)1-1 and onto 2)1-1 but not onto 3)onto but not 1-1 4)neither 1-1 not onto

66. If f(x)=$(25-x^4)^{1/4}$ for $0<x<\sqrt{5}$ then f[f(1/2)]= (2001)
1)2 2)1 3)1/2 4)4

67. f(x)=3x-4,g(x)=2+3x for x$\in$R $g^{-1}(f^{-1}(5))$=_____ (2002)
1)1 2)3 3)1/3 4)3/1

68. f:R$\rightarrow$R is defined by f(x)=$\cos^2$x+$\sin^4$x for x$\in$R then f(R)=_____(2002)
1)(3/4,1) 2)[3/4,1] 3)[3/4,1) 4)(3/4,1]

69. If f(x)= $\cos^2$x+$\sin^4$x)/($\sin^2$x+$\cos^4$x) for x$\in$R then f(2002) is_____(2002)
1)2 2)3 3)1 4)22

70. A={x/x$\in$R, x is non-zero, -4$\leq$x$\leq$4} and f:A$\rightarrow$R defined by f(x)=|x|/x for x$\in$A then range of f is__ (2002)

1)(-1,1) 2)[-1,1] 3)(-1,1] 4)[-1,1)

71. If f:R$\rightarrow$R and g:R$\rightarrow$R defined by f(x)=|x| andg(x)=[x] for each x$\in$R then {x$\in$R:g(f(x)$\leq$f(g(x)=_____ (2003)
1)Set of real numbers R 2)Z 3)Q 4)W

72. f:[-2,2]$\rightarrow$R is defined by f(x) = -1 for -2$\leq$x$\leq$0
= x-1 for 0 $\leq$x$\leq$2
then x{$\in$[-2,2]:x$\leq$0 and f(f(x)) = x} is_____ (2003)
1)x =1/2 2)x = -1/2 3)2 4)1

73. The function f:R$\rightarrow$R is defined by f(x)=3^{-x}. Observe the following statements
I.f is one-one II. F is onto III. F is a decreasing function
Out of these, true statements are: (2004)
1)only I, II 2)only II,III 3)only I,III 4)I,II,III

74. The function f:R$\rightarrow$R is defined by f(x)=3^{-x}. Observe the following statements
I.f is one-one II. F is onto III. F is a decreasing function
Out of these, true statements are: (2004)

1)only I, II 2)only II,III 3)only I,III 4)I,II,III

75. . $f(x)=\begin{cases}[x] & \text{if } -3<x\leq -1\\ |x| & \text{if } -3<x<1\\ |[-x]| & \text{if } 1\leq x<3\end{cases}$ then $\{x:f(x)\geq 0\}=$ (2004)

1)(-1,3) 2)[-1,3) 3)(-1,3} 4)[-1,3]

76. If f: N→Z is defined by $f = \begin{cases}2 & \text{if } n=3k, k\in Z\\ 10-n & \text{if } n=3k+1, k\in Z\\ 0 & \text{if } n=3k+2, k\in Z\end{cases}$ then

$\{n\in N:f(n)>2\}=$ (2004)

1){3,6,4} 2){1,4,7} 3){4,7} 4){7}

77. The function f:c → c defined by f(x) = (ax+b)/(cx+d) for x εc where bd ≠0 reduce to a constant function if: (2005)

1)a=c 2)b=d 3)ad=bc 4)ab=cd.

78. If N denotes the set of all positive integers and If f:N→ N is defined by f(n)= the sum of positive divisors of n then $f(2^k.3)$, where k is a positive integers, is [2005]

1)$(2^{k+1}-1)$ 2)$2(2^{k+1}-1)$ 3)$3(2^{k+1}-1)$ 4)$4(2^{k+1}-1)$

79. If $\{x\in R:[x-|x|]=5\}$ = _____ [2005]

1)R, the set of all real numbers 2)φ, the empty set

3){x εR:x<0} 4){xε r:x≥o}

80. If f: R→ R is defined by f(x)= x-[x]-1/2 for x∈R ,where [x] is the greatest integer not exceeding x, then {x ∈R : f(x) =1/2}=___ [2006]

1) z the set of all integers 2)N, the set of all natural numbers 3)ϕ, the empty set 4)R

81. If f: R→ R is defined by f(x)= [2x]-2[x] for x∈R ,where [x] is the greatest integer not exceeding x, then the range of f is___ [2006]

1) {x∈R: 0≤x≤1} 2){0,1} 3) {x∈R: x> 0} 4){ x∈R:x<0}

82. If f:R → R is defined by

$$f(x)=\begin{cases}x+4 & \text{for } x<-4\\ 3x+2 & \text{for } -4\leq x<4\\ x-4 & \text{for } x\geq 4\end{cases}$$

then the correct matching of List I from List II is

List-I	List-I
a)f(-5) +f(-4)	i)14
b) f(|f(-8)|)	ii) 4
c)f(f(-7)+f(3))	iii)-11
d)f(f((f(f(0)))) +1	iv)-1
	v)1
	vi)0

[2006]

	A	B	C	D
1)	iii	vi	ii	v
2)	iii	iv	ii	v
3)	iv	iii	ii	i
4)	iii	vi	v	ii

1)c,d,a,b 2)c,b,a,e 3)c,a,e,d 4)c,b,e,d

83. If f: R→R and g: R→R are defined by f(x) = x-[x] and g(x) =[x] for x∈R, where [x] is the greatest integer not exceeding x, then for every x∈R,f(g(x)) =
1) x 2)0 3)f(x) 4)g(x) [2007]

84. If f: R→R is defined by f(x) = 1/(2-cos3x) for each x ∈ R then the range of f is
1) (1/3,1) 2)[1/3,1] 3)(1,2) 4)[1,2] [2007]

85. If f: R→R and g: R→R are defined by f(x) = $|x|$ and g(x) =[x-3] for x∈R, then $\left\{g(f(x)) : -\frac{8}{5} \langle x \langle \frac{8}{5}\right\} =$ [2008]
1){0,1} 2){1,2} 3){-3,-2} 4){2,3}

86. If f: R→C is defined by f(x) =e^{2ix} for x∈R then, f is [2008]
1) one-one 2) onto 3) one-one and onto 4) neither one-one nor onto

87. If f: [-6,6]→R defined by f(x) = x^2-3 for x∈R then
$(fofof)(-1) + (fofof)(0) + (fofof)(1) =$ [2008]
1) $f(4\sqrt{2})$ 2) $f(3\sqrt{2})$ 3) $f(2\sqrt{2})$ 4) $f(\sqrt{2})$

88.If f : [2, 3] → IR is defined by $f(x) = x^3 + 3x - 2$, then the range $f(x)$ is contained in the interval : [2009]
1) [1, 12] 2) [12, 34] 3) [35, 50] 4) [–12, 12]

89. $\left\{x \in \text{IR} : \frac{2x\text{-}1}{x3 + 4x2 + 3x} \in \text{IR}\right\} =$ [2009]
1) IR – {0} 2) IR – {0, 1, 3} 3) IR – (0, –1, –3) 4) IR – (0, –1, –3, $+\frac{1}{2}$)

90. If f(0)=0, f(1)=1, f(2)=2 and f(x)=f(x-2)+f(x-3) for x=3,4,5,….. then f(9)= [2010]
1) 12 2) 13 3) 14 4) 10

91. Let R denote the set of all real numbers and R^+ denote the set of all positive real numbers. For the subsets A and B of R define f: A→B by f(x) =x^2 for $x \in A$. Observe the two lists given below: [2010]

List – I	List – II
i) f is one – one and onto if	a) $A=R^+$, $B=R$
ii) f is one – one but onto if	b) $A=B=R$
iii) f is onto but not one – one if	c) $A=R$, $B=R^+$
iv) f is neither one – one nor onto if	d) $A=B=R^+$

The correct matching of List – I to List – II

	(i)	(ii)	(iii)	(iv)
(1)	a	b	c	d
(2)	d	b	a	c
(3)	d	a	c	b
(4)	d	b	c	a

92. If f: $[2, \infty) \to B$ defined by $f(x) = x^2 - 4x + 5$ is a bijection, then B = (2011)
1) $[0, \infty)$ 2) $[1, \infty)$ 3) $[4, \infty)$ 4) $[5, \infty)$

93. If f: □ is defined by $f(x) = \left[\frac{x}{5}\right]$ for $x \in$ □ , where [y] denotes the greatest integer not exceeding y, then $\{f(x) : |x| < 71\} =$ (2011)
1) $\{-14, -13, ..., 0, ..., 13, 14\}$ 2) $\{-14, -13, ..., 0, ..., 14, 15\}$
3) $\{-15, -14, ..., 0, ..., 14, 15\}$ 4) $\{-15, -14, ..., 0, ..., 13, 14\}$

94. If f: $R \to R^+$ and g : $R^+ \to R$ are such that $g(f(x)) = |\sin x|$ and $f(g(x)) = (\sin\sqrt{x})^2$, then a possible choice for f and g is (2012)
(1) $f(x) = x^2$, $g(x) = \sin\sqrt{x}$ 2) $f(x) = \sin x$, $g(x) = |x|$
(2) $f(x) = \sin^2 x$, $g(x) = \sqrt{x}$ 4) $f(x) = x^2$, $g(x) = \sqrt{x}$

95. If f: $Z \to Z$ is defined by

$$f(x) = \begin{cases} \frac{x}{2} & \text{if x is even} \\ 0 & \text{if x is odd} \end{cases}$$

Then f is (2012)
1) Onto but not one to one 2) One to one but not onto
3) One to one & onto 4) Neither one to one nor onto

96. If $f(x) = (p - x^n)^{1/n}$, $p > 0$ & n is a positive integer, then f(f(x)) = (2013)
1) x 2) x^n 3) $p^{1/n}$ 4) $p - x^n$

97. $\left\{X \in R \mid LOG\left[(1.6)^{1-X^2} - (0.625)^{6(1+X)}\right] \in R\right\} =$ (2013)
1) $(-\infty, -1) \cup (7, \infty)$ 2) $(-1, 5)$ 3) $(1, 7)$ 4) $(-1, 7)$

98. If R is the set of all numbers & if f : R – {2} → R is defined by $f(x)=\frac{2+x}{2-x}$ for $x \in R-\{2\}$ then the range of f is (2014)

1) R 2) R – {1} 3) R – {-1} 4) R – {-2}

99. Let Q be the set of all rational numbers in [0,1] & f: [0,1] → [0,1] be defined by $f(x)=\begin{cases} x & for\, x \in Q \\ 1-x & for\, x \neq Q \end{cases}$ Then the set S = {x∈[0, 1]: (fof)(x) = x} is equal to [2014]

1) Q 2) [0. 1] – Q 3) (0, 1) 4) [0, 1]

100. If f(x) is a real function defined on [-1, 1], then the real function g(x) = f(5x + 4) is defined on the interval (2015)

1) [-4, 9] 2) [-1, 9] 3) [-2, 9] 4) [-3, 9]

101. If f: N → R is defined by f(1) = -1 & f(n + 1) = 3f(n) + 2 for n > 1 then f is (2015)

1) one – one 2) onto 3) a constant function 4) f(n) > 0 for n > 1

102. If f: R → R, g: R → R are defined by f(x) = 4x – 3, g(x) = x^2 + 3, then $(gof^{-1})(3)$ = [2015 A.P.]

1) $\frac{25}{9}$ 2) $\frac{111}{25}$ 3) $\frac{9}{25}$ 4) $\frac{25}{111}$

103. If $A=\left\{x \in R \frac{\pi}{4} \leq x \leq \frac{\pi}{3}\right\}$ & f(x) = sinx – x, then f(A) = [2015 A.P.]

1) $\left[\frac{\sqrt{3}}{2}-\frac{\pi}{3}, \frac{1}{\sqrt{2}}-\frac{\pi}{4}\right]$ 2) $\left[-\frac{1}{\sqrt{2}}-\frac{\pi}{4}, \frac{\sqrt{3}}{2}-\frac{\pi}{3}\right]$ 3) $\left[-\frac{\pi}{3}, \frac{-\pi}{4}\right]$ 4) $\left[\frac{\pi}{4}, \frac{\pi}{3}\right]$

104. If f(x) = x^2 – 2x + 4 then the set of values of x satisfying f(x – 1) = f(x + 1) is (2016)

1) {-1} 2) {-1, 1} 3) {1} 4) {1, 2}

105. The number of real linear functions f(x) satisfying f(f(x)) = x + f(x) is (2016)

1) 0 2) 4 3) 5 4) 2

106. The domain of the function $f(x)=\sqrt{\log_{0.5} x!}$ (2016AP)

1) {0, 1, 2, 3, ……. } 2) {1, 2, 3, ……. }

3) $(0,\infty)$ 4) {0, 1}

107. If f(x) = |x – 1| + |x – 2| + |x – 3|, 2 < x < 3, then f is 2016AP)

1) An onto function but not one – one 2) One–one function but not onto

3) A bijection 4) Neither one – one not onto

108. $f:(-\infty,0]\to[0,\infty)$ is defined as f(x) = x^2.The domain & range of its inverse is (2017)

1) Domain of (f^{-1}) = [0, ∞), Range of (f^{-1}) = ($-\infty$, 0]
2) Domain of (f^{-1}) = [0, ∞), Range of (f^{-1}) = ($-\infty$, ∞]
3) Domain of (f^{-1}) = [0, ∞), Range of (f^{-1}) = (0, ∞]
4) f^{-1} does not exist

109. If the range of the function f(x) = -3x – 3 is {3, - 6, -9, -18}, then which of the following elements is not in the domain of f? (2017)

1) -1 2) -2 3) 1 4) 2

110. A function from A = {x: -1 ≤ x ≤ 1} to itself which is not a bijection is (2017AP)

1) f(x) = x|x| 2) f(x) = x^3 3) f(x) = x^2 4) $f(x)=\sin\left(\frac{\pi x}{2}\right)$

111. If $f:\mathbb{R}-\{0\}\to\mathbb{R}$ is defined by $f(x)=x+\frac{1}{x}$ & $f^k(x)$ = $[f(x)]^k$ for k ≥ 1 then $f^4(x) - f(x^4) - 4f^2(x)$ = (2017AP)

1) – 2 2) 2 3) 1 4) – 1

112. Let f(x) be a quadratic expression such that f(0) + f(1) = 0. If f(-2) = 0, then

1) $f\left(\frac{-2}{5}\right)=0$ 2) $f\left(\frac{2}{5}\right)=0$ 3) $f\left(\frac{-3}{5}\right)=0$ 4) $f\left(\frac{3}{5}\right)=0$

KEY

1) 4	2) 2	3) 3	4) 1	5) 4	6) 1	7) 3	8) 3	9) 3	10) 2
11) 3	12) 1	13) 3	14) 4	15) 2	16) 1	17) 2	18) 1	19) 3	20) 1
21) 4	22) 2	23) 2	24) 1	25) 1	26) 2	27) 1	28) 2	29) 3	30) 2
31) 4	32) 1	33) 3	34) 2	35) 1	36) 1	37) 4	38) 3	39) 2	40) 1
41) 4	42) 3	43) 1	44) 1	45) 4	46) 3	47) 1	48) 1	49) 2	50) 2
51) 2	52) 2	53) 3	54) 1	55) 2	56) 4	57) 1	58) 3	59) 1	60) 4
61) 1	62) 2	63) 1	64) 2	65) 3	66) 3	67) 3	68) 2	69) 3	70) 2
71) 1	72) 2	73) 2	74) 2	75) 1	76) 2	77) 3	78) 4	79) 2	80) 3
81) 2	82) 1	83) 2	84) 2	85) 3	86) 4	87) 1	88) 2	89) 3	90) 4
91) 3	92) 2	93) 3	94) 3	95) 1	96) 1	97) 1	98) 3	99) 4	100) 2
101) 3	102) 2	103) 1	104) 3	105) 4	106) 4	107) 2	108) 1	109) 1	110) 3
111) 1	112) 4	113)	114)	115)	116)	117)	118)	119)	120)

EXERCISE-B

1. If f(x)=sin(logx), then $f\left(\frac{x}{y}\right)+f(xy)-2f(x)\cos(\log y)=$

   1) 0 2) sin(logx) 3) cos(logx) 4) cos(logy)

2. Let g(x) = 1+x-[x] & $f(x)=\begin{cases}-1, \text{if } x<0\\ 0, \text{if } x=0\\ 1, \text{if } x>0\end{cases}$ then $\frac{f(g(2009))}{g(f(2009))}=$

   1) x 2) 1 3) f(x) 4) g(x)

3. If $f(x)=\frac{1}{2}\left[3^x+3^{-x}\right]$, $g(x)=\frac{1}{2}\left[3^x-3^{-x}\right]$ then f(x)g(y)+f(y)g(x)=

   1) f(x+y) 2) g(x+y) 3) 2f(x) 4) 2g(x)

4. Let $f(x)=\frac{x+1}{x-1}$, f0f(x)=f^2(x); f0f0f(x)f^{-3}(x), f0f0f0f(x)=f^{-4}(x)…… then $f^{2008}(x)=$

   1) x 2) f(x) 3) 0 4) 1/x

5. If $f(x)=\frac{1}{\sqrt{x+2}\sqrt{2x-4}}+\frac{1}{\sqrt{x-2}\sqrt{2x-4}}$ for x>2, then f(11)=

   1) $\frac{7}{6}$ 2) $\frac{5}{6}$ 3) $\frac{6}{7}$ 4) $\frac{5}{7}$

6. Let f: $\left[\frac{1}{2},1\right]\longrightarrow[-1, 1]$ is given by f(x) = $4x^3 - 3x$ then f^{-1}(x) is given by

   1) $\cos\left[\frac{1}{3}\cos^{-1}x\right]$ 2) 3cos($\sin^{-1}$x) 3) 3$\sin^{-1}$(cosx) 4) $\sin\left[\frac{1}{3}\cos^{-1}x\right]$

7. If f: $[1,\infty]\longrightarrow[2,\infty)$ is given by f(x) = x+ $\frac{1}{x}$ then f^{-1}(x) =

   1) $\frac{x+\sqrt{x^2-4}}{2}$ 2) $\frac{x}{1+x^2}$ 3) $\frac{x-\sqrt{x^2-4}}{2}$ 4) $1+\sqrt{x^2-4}$

8. If f:$[1, \infty)\longrightarrow[1, \infty)$ is defined by f(x)=$2^{x(x-1)}$ then f^{-1}(x)=

   1) $\frac{x(x-1)}{2}$ 2) $\frac{\left(1+\sqrt{1+4\log_2 x}\right)}{2}$ 3) $\frac{\left(1-\sqrt{1+4\log_2 x}\right)}{2}$ 4) 2x(x+1)

9. The domain of $|x-2|+|x-5|$ is

   1) R-{2,5} 2) R-{0} 3) $(0, \infty)$ 4) R

10. Domain of $\sqrt{\frac{x-1}{2-x}}$ is

    1) (1, 2) 2) (0, 2) 3) [1, 2) 4) [1,2]

11. If the number of surjections that can be defined from A onto {1, 2} is 30 then n(A)=

1) 3 2) 4 3) 5 4) 6

12. The number of linear functions which map from [-1, 1] onto [0, 2] is

1) 0 2) 1 3) 2 4) Infinite

13. If f(x) px+q & g(x)=rx+s, then, f(g(x))=g(f(x)) $\Leftrightarrow$

1) f(p) = g(p) 2) f(q) = g(p) 3) f(s) = g(q) 4) f(r)=g(p)

14. If f(x) = sin(logx) then $f\left(\frac{x}{y}\right)+f(xy)-2f(x)cos(log\ y)=$

1) 0 2) sin(logx) 3) cos(logx) 4) cos(logy)

15. If f(x)=cos(logx), then $f(x^2)$,$f(y^2)$- $\frac{1}{2}$ [$f(x^2y^2)$+$f\left(\frac{x^2}{y^2}\right)$]=

1) -2 2) -1 3) $\frac{1}{2}$ 4) 0

16. $f(x)=log\left(\frac{1+x}{1-x}\right)$ satisfies the equation $f(x_1)+f(x_2)$=

1) $f\left(\frac{x_1+x_2}{1+x_1x_2}\right)$ 2) $f\left(\frac{x_1+x_2}{1-x_1x_2}\right)$ 3) $f\left(\frac{x_1-x_2}{1+x_1x_2}\right)$ 4) $f(x_1x_2)$

17. If f(x)=logx, g(x)=x^3, then f(g(a))+f(g(b))=

1) f(g(a)+g(ab)) 2) f(g(ab)) 3) g(f(ab)) 4) g(f(a)+f(b))

18. If f:R→R, g:R→R are defined by f(x)=x^2+2x-3, g(x)=3x-4, & if (fog)(x)=32 for the values of x say x^1,x^2 then $x_1^3+x_2^3$ =

1) 165 2) 26 3) 16 4) -16

19. If g(x)=1+$\sqrt{x}$ & f(g(x))=3+2$\sqrt{x}$ +x, then f(x)=

1) 1+2x^2 2) 2+x^2 3) 1+x 4) 2+x

20. If $f(x)=\frac{1}{\sqrt{x+2\sqrt{2x-4}}}+\frac{1}{\sqrt{x-2\sqrt{2x-4}}}$ for x>2, then f(11)=

1) $\frac{7}{6}$ 2) $\frac{5}{6}$ 3) $\frac{6}{7}$ 4) $\frac{5}{7}$

KEY

1) **1**	2) **2**	3) **2**	4) **1**	5) **3**	6) **1**	7) **1**	8) **2**	9) **4**	10) **2**
11) **3**	12) **3**	13) **3**	14) **1**	15) **4**	16) **1**	17) **2**	18) **2**	19) **2**	20) **3**

2. MATHEMATICAL INDUCTION
IMPOTANT POINTS, FORUMLAE AND SHORTCUTS

1. Principle of finite Mathematical induction:
   Let p (n) is a set of statements:
   If P (1) is true,
   P (m) is true
   $\Rightarrow$P (m+1) is true
   then P (x) is true for all $n \in N$

2. Principle of complete Mathematical induction:
   Let P (x) is a set of statements
   If P(1) is true
   P(2) is true
   P(3) is true
   P(m-1) is true
   Then p(n) is true for all $n \in N$

3. $\Sigma n = n(n+1)/2$ = sum of first n natural numbers.

4. $\Sigma n^2 = n(n+1)(2n+1)/6$= sum of squares of first 'n' natural numbers.

5. $\Sigma n^3 = n^2(n+1)^2/4$ = sum of cubes of first n natural numbers.

6. $\Sigma n^3 = (\Sigma n)^2$

7. sum of first n even positive integers $=\Sigma 2n = n(n+1)$

8. sum of first n odd positive integers $= \Sigma(2n-1) = n^2$

9. $\Sigma n(n+1) = n(n+1)(n+2)/3$

10. $\Sigma n(n+1)(n+2) = n(n+1)(n+2)(n+3)/4$

<u>for A.P:</u>

11. $t_n = a+(n-1)d$

12. $S_n = n/2\,[2a+(n-1)d]$

<u>For G.P</u>:

13. $t_n = ar^{n-1}$

14. $S_n = a(r^n-1)/r-1$ $(r>1)$

$S_n = a(1-r^n)$ /1-r (r <1)

15. $S_\infty = \dfrac{a}{1-r}$

<u>For AGP</u>:

16. Sum $= \dfrac{a}{1-r} + \dfrac{dr}{(1-r)^2}$

EXERCISE-A

1. 7^{2n}-48n-1 is divisible by _____
   1)2304 2) 576 3) 24 4) 13

2. $(49)^n$+16n-1 is divisible by _____
   1)44 2)64 3)66 4)24

3. 7^{2n} +2 $^{3n-3}$. 3 $^{n-1}$ is divisible by _____
   1) 25 2) 35 3) 45 4) 55

4. $10^n + 3.4^{n+2} + 5$ is divisible by_____
   1) 9 2) 24 3) 16 4) 7

5. $n^2(n^4-1)$ is divisible by ____
   1) 60 2) 120 3) 45 4) 90

6. n^5-n is divisible by _____
   1) 30 2) 240 3) 60 4) 480

7. 1+3+5+…..+ (2n-1) =_____
   1)n^2 2) n^3 3)n 4)2n

8. 1.3 + 2.4 + 3.5+….. to n terms =_____
   1)n(n+1) 2) (n+1)(n+2) /2 3) n(n+1) (2n+7) / 6 4) n

9. 1.2.3+2.3.4+….. to n term =___
   1)n(n+1)(n+2)(n+3) /4 2) n(n+1)/2 3) n(n+1)(n+2) /3 4) n+1

10. 2+8+14+…. to n terms =____
    1)$3n^2$+n 2) $3n^2$-n 3) $4n^2$-1 4) n-1

11. n th term of 3+7+13+21+…. is ____
    1)4n-1 2) n^2+2n 3) n^2+n+1 4) n^2+2

12. $\sum_{r=1}^{n} 1+\frac{1}{2^r} =$

1)$n+1-2^{-n}$ 2)$n-1-2^{-n}$ 3)$n+1+2^{-n}$ 4)$n+2+2^{-n}$

13. (1/1.4)+(1/4.7)+(1/7.10)+—— to n terms

1)n/3n+1 2)n/2n+1 3)3n+1 4)2n+1

14. 1 + (2+3+4) +(5+6+7+8+9)+-----n brackets=

1)) n(n+1)(n+2)/6 2)) n(n+1)(n+2) 3)) n(n+1)/3 4)) n(2n+1)(n+2)

15. I : 1+3+5+……..+(2n-1) = n^2

II : 2+4+6+……..+2n=n^2

1)only I is true 2)Only II is true

3)Both I and II are true 4)Both are not true

16. 1/1.2+1/2.3+1/3.4+———+1/n(n+1)=_____

1)n(n+1) 2)n/n+1 3)n(n+1)(n+2) 4)n+1/n+2 4)n^2

17. $1^2+3^2+5^2+$———$+(2n-1)^2$=_____

1)$(4n^3-n)/3$ 2)$(4n^3+n)/3$ 3)$(4n^2+n)/3$ 4)$(4n^2-n)/3$

18. $1^2+(1^2+2^2)+(1^2+2^2+3^2)+$———— to n terms

1)n(n+1)(n+2) 2)n(n+1)(n+2)/12 3)n(n+2)/12 4)$n(n+1)^2(n+2)/12$

19. A : If n∈ N, product of n(n+1)(n+2) is divisible by 6.

R : Product of 3 consecutive positive integers is divisible by 3 .

1) A,R are true and R is correct explanation of A

2)A,R are true but R is not the correct explanation of A

3)A true, r false 4)A false, R true

20. n∈ N,Cosθ Cos2θ Cos4θ…..$Cos2^{n-1}\theta$ =

1)$(Sin^{2n-1}\theta)$ /$(2^{2n-1}$ Sinθ) 2)$Cos2^{n-1}/2^{n-1}Cos\theta$

3)$Sin2^n\theta$ /$2^nSin\theta$ 4)$Cos2^n\theta$ /$2^nCos\theta$

21. The nth term of the series $\frac{1}{1.3-\frac{3}{8}}+\frac{1}{2.5-\frac{3}{8}}+\frac{1}{3.7-\frac{3}{8}}+.....$ is

1) $\frac{8}{(4n-1)(4n-3)}$ 2) $\frac{8}{(4n+1)(4n-3)}$

3) $\frac{8}{(4n-1)(4n+3)}$ 4) $\frac{8}{(4n+1)(4n+3)}$

22. $S = \frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \ldots\ldots + n$ terms

Match the following.

I : $\lim_{n \to \infty} S =$ a)0

II: $\lim_{n \to 0} S =$ b)3/10

III: $\lim_{n \to 3} S =$ c)1/3

IV: $\lim_{n \to 4} S =$ d)10

e)4/13

1)c,d,e,a 2)b,d,a,c 3)b,e,a,c 4)c,a,b,e

23. If $n \in N$ then $(11)^{n+2} + (12)^{2n+1}$ is divisible by _____

1)49 2)133 3)132 4)16

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24. sum of n terms of 1.2+2.3+3.4 +……. is_____ [1986]

1)n(n+1)/2 2) n(n+1) (n+2) /3 3) n(n-1) 4) none

25. $\sum_{n=0}^{\infty} (-1)^n x^{n+1} =$_____ [1991]

1) $\frac{1}{1+x}$ 2) $\frac{x}{1+x}$ 3) $\frac{-1}{1+x}$ 4) None

26. If n is a positive integer, n^3+2n is divisible by____ [1995]

1)3 2) 3) 6 4) 5

27. $\sum_{k=1}^{n} k (1+1/n)^{k-1} =$_____ [2000]

1) n(n-1) 2) n(n+1) 3) n^2 4) $(n+1)^2$

28. If $a_k = 1/k (k+1)$ for k = 1,2,3.. n then $(\sum_{k=1}^{n} a_k)^2 =$ [2000]

1)n/(n+1) 2) $n^2/(n+1)^2$ 3) $n^4/(n+1)^4$ 4) $n^6/(n+1)^6$

29. If $2^3+4^3+6^3+\ldots + (2n)^3 = kn^2(n+1)^2$ then k= _____ [2001]

1) 1/2 2) 1 3) 3/2 4) 2

30. If the natural numbers are divided into groups of {1},{2,3},{4,5,6},{7,8,9,10}—- then the sum of 50th group is (2002)

1)62525 2)65225 3)56255 4)55625

31. .If $t_n=(n+2)(n+3)1/4$ for n=1,2,3,…. Then $1/t_1+t_2+1/t_3+\ldots+1/t_{2003}=$__ (2003)
1)4006/3006 2)4003/3007 3)4006/3008 4)4006/3009

32. $\sum_{k=1}^{5} \frac{1^3+2^3+\ldots\ldots+k^3}{1+3+5+\ldots\ldots+(2k-1)}=$__ (2004)
1)22.5 2)24.5 3)28.5 4)32.5

33. $\{n(n+1)(2n+1:n\in Z)\}\subset$ (2005)
1)$\{6k:k\in Z\}$ 2)$\{12k:k\in Z\}$ 3)$\{18k:k\in Z\}$ 4)$\{24k:k\in Z\}$

34. For all integers $n\geq 1$, which of the following is divisible by 9: (2006)
1)8^n+1 2)4^n-3n-1 3)$3^{2n}+3n+1$ 4)10^n+1

35. $S_n=1^3+2^3+3^3+\ldots..+n^3$ and $T_n=1+2+\ldots.+n$ then (2007)
1)$S_n=T_n^3$ 2) $S_n=T_n^2$ 3) $S_n=T_n$ 4) $S_n=T_n^3$

36. For any integer $n\geq 1$ then sum $\sum_{k=1}^{n} k(k+2)$ is equal to (2008)
1) n(n+1) (n+2) / 6 2)n(n+1)(2n+1) /6 3) n(n+1)(2n+7)/6 4) n(n+1)(2n+9) /6

37. Using mathematical induction, the numbers a_n's are defined by,
$a_0 = 1$, $a_{n+1} = 3n^2 + n + an(n\geq 0)$ Then $a_n =$ (2009)
1) $n^3 + n^2 + 1$ 2) $n^3 - n^2 + 1$ 3) $n^3 - n^2$ 4) $n^3 + n^2$

38. The numbers $a_n=6^n - 5n$ for n=1,2,3,……. when divided by 25 leaves the remainder: (2010)
1) 9 2) 7 3) 3 4) 1

39.Let n = 1! + 4! + 7! + ……..+ 400! Then ten's digits of n is : (2010)
1) 1 2) 6 3) 2 4) 7

40.If a, b and n are natural numbers then $a^{2n-1} + b^{2n-1}$ is divisible by: (2011)
1) a + b 2) a – b 3) $a^3 + b^3$ 4) $a^2 + b^2$

41.If $\frac{1}{2\times 4}+\frac{1}{4\times 6}+\frac{1}{6\times 8}+\ldots\ldots\ldots\ldots(n\,terms)=\frac{kn}{n+1}$ then k = (2012)
1) $\frac{1}{4}$ 2) $\frac{1}{2}$ 3) 1 4) $\frac{1}{8}$

42.If I is the identity matrix of order 2 & $A=\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}$, then for $n\geq 1$, mathematical induction gives (2013)

1) $A^n = nA - (n-1)I$ 2) $A^n = nA + (n-1)I$

3) $A^n = 2^n A - (n+1)I$ 4) $A^n = 2^{n-1} A - (n-1)I$

43. $\sum_{k=1}^{2n+1} (-1)^{k-1} .k^2 =$ (2014)

1) (n+1)(2n+1) 2((n+1)(2n-1) 3) (n-1)(2n+1) 4) (n-1)(2n-1)

44. The remainder of $n^4 - 2n^3 - n^2 + 2n - 26$ when divided by 24 is (2015)

1) 20 2) 21 3) 22 4) 23

45. The value of the sum 1.2.3 + 2.3.4 + 3.4.5 + ……. Upto n terms = (2015 A.P.)

1) $\frac{1}{6}n^2(2n^2+1)$ 2) $\frac{1}{6}(n^2-1)(2n+3)$

3) $\frac{1}{8}(n^2+1)(n^2+5)$ 4) $\frac{1}{4}n(n+1)(n+2)(n+3)$

46. The remainder when $7^n - 6n - 50$ ($n \in N$) is divided by 36, is (2016)

1) 22 2) 23 3) 1 4) 21

47. The greatest positive integer which divides (n + 16)(n + 17)(n + 18)(n + 19), for all positive integers n, is (2016AP)

1) 6 2) 24 3) 28 4) 20

48.For any integer $n \geq 1, \sum_{K=1}^{n} K(K+2) =$ (2017)

1) $\frac{n(n+1)(n+2)}{6}$ 2) $\frac{n(n+1)(2n+7)}{6}$

3) $\frac{n(n+1)(2n+1)}{6}$ 4) $\frac{n(n-1)(2n+8)}{6}$

49.If $4^3 + 8^3 + 12^3 +$ …… upto n terms = $kn^2(n+1)^2$ (for all $n \in N$), then k = (2017AP)

1) 4 2) 8 3) 16 4) 32

KEY

1) 1	2) 2	3) 1	4) 1	5) 1	6) 1	7) 1	8) 3	9) 1	10) 2
11) 3	12) 1	13) 1	14) 1	15) 1	16) 2	17) 1	18) 4	19) 1	20) 3
21) 3	22) 4	23) 2	24) 2	25) 2	26) 1	27) 3	28) 2	29) 4	30) 1
31) 4	32) 1	33) 1	34) 2	35) 2	36) 3	37) 2	38) 4	39) 2	40) 1
41) 1	42) 1	43) 1	44) 3	45) 4	46)2	47)2	48)2	49)3	

EXERCISE-B

1. $1.2+2.3+3.4+.....n$ terms =

1) $\frac{n(n+1)(n+5)}{3}$ 2) $\frac{n(n+1)(n+2)}{3}$ 3) $\frac{4(4n^2+6n-1)}{3}$ 4) $n(n+1)(n+1)^2$

2. $2+3.2+4.2^2+5.2^3+$……. n terms

1) 2^n 2) $n.2^{n-1}$ 3) $n.2^n$ 4) $n.2^{n+1}$

3. If $t_n=\sum_1^n n$, then $\sum_1^n t_n$

1) $\frac{n(n+1)}{2}$ 2) $\frac{n(n+3)}{2}$ 3) $\frac{n(n+1)(n+2)}{6}$ 4) $\frac{n(n+4)}{2}$

4. $1.n+2.(n-1)+3(n-2)+$……$+(n-1).2+n.1=$

1) $\frac{n(n+1)(2n+1)}{6}$ 2) $\frac{n(n+1)(n+2)}{6}$ 3) $\frac{n(n^2+1)}{2}$ 4) $\frac{n(n+1)}{2}$

5. $3.6+4.7+5.8+$……..$+(n-2)$ terms=

1) n^3+n^2+n+2 2) $\frac{n^3+6n^2+5n-42}{3}$ 3) $\frac{n(n+1)}{n+4}$ 4) $2n^3-2n^2$

6. If $1^3+2^3+3^3$ ……. $+50^3=k^2$, then k =

1) 1010 2) 2010 3) 1275 4) 5050

7. If $S_1=\{1\}$, $S_2=\{2,3\}$, $S_3=\{3,6,9\}$, $S_4=\{4,8,12,16\}$, ……. Then sum of the numbers in the set S_{10} is

1) 450 2) 550 3) 475 4) 575

8. The statement $2^{n+2}<3^n$ is true for

1) All $n\in N$ 2) All n>2 3) All n>3 4) None of these

9. The inequality $n!>2^{n-1}$ is true for:

1) n>2 2) $n\in N$ 3) n>3 4) None of these

10. The smallest positive integer n for which $n!<\left(\frac{n+1}{2}\right)^n$ holds, is:

1) 1 2) 2 3) 3 4) 4

11. If the sum of n terms of an A.P. is $\frac{4n^2-3n}{4}$ then n^{th} term of the A.P. is

1) $\frac{5n-1}{4}$ 2) $\frac{8n-7}{4}$ 3) $\frac{3n^2-2}{4}$ 4) $\frac{4n-8}{5}$

12. For all positive integral values of n, $\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+.....+\frac{1}{n(n+1)}=$

1) $\frac{n}{n+1}$ 2) $\frac{n+1}{n+2}$ 3) $\frac{n^2}{n+1}$ 4) $\frac{2n}{n+3}$

13. $x^{2n+1}+y^{2n+1}$ is divisible by _____ for all $n\in N$

1) x^2+y^2 2) x+y 3) x^3+y^3 4) x^5+y^5

14. If $n\in N$ $x^{n+1}+(x+1)^{2n-1}$ is divisible by

1) x 2) x+1 3) x^2+x+1 4) x^2-x+1

15. $\frac{(n+2)!}{(n-1)!}$ is divisible by

1) 6 2) 11 3) 24 4) 26

16. $\left(\frac{n+1}{2}\right)^n \geq n!$ is true

1) For all $n \in N$ 2) For all n>1 3) For all n>2 4) For all n>3

17. In the sequence {1{, {2,3}, {4,5,6}, {7,8,9,10}…… of sets, the sum of elements in the nth set is

1) $\frac{n(n+1)}{6}$ 2) $\frac{n(n^2+1)}{2}$ 3) $\frac{n(n+1)(n+2)}{6}$ 4) $\frac{n(n+2)}{3}$

18. If $1^2+2^2+\ldots\ldots\ldots\ldots\ldots\ldots+n^2=1015$, then the value of n is

1) 15 2) 14 3) 13 4) 11

19. If $1^3+2^3+3^3+\ldots\ldots\ldots\ldots\ldots+50^3=k^2$ then k=

1) 1010 2) 2010 3) 1275 4) 5050

20. $\left(1-\frac{1}{2}\right)\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\ldots\ldots\ldots\left(1-\frac{1}{n+1}\right)=$

1) $\frac{1}{n+1}$ 2) $\frac{n}{n+1}$ 3) $\frac{1}{n+2}$ 4) $\frac{n-1}{n+1}$

KEY

1) **2**	2) **3**	3) **3**	4) **2**	5) **2**	6) **3**	7) **2**	8) **3**	9) **3**	10) **2**
11) **2**	12) **1**	13) **2**	14) **3**	15) **1**	16) **1**	17) **2**	18) **2**	19) **3**	20) **1**

Exercise-C

1. 1+3+6+ ….. n terms =
   1)n(n+2)/3 2)n(n+1)(n+2)/3 3)n(n+1)(n+2)/6
   4)n(n+1)(2n+1)/6

2. 2+4+7+11+16+ … n terms=
   1)n(n+1)(2n+3)/6 2)$n(n^2+3n+8)/6$ 3)$n(5n^2-12n+1)/6$ 4)$n(5n^2+12n-1)/6$

3. The nth term of the series 5+14+29+50+ …is
   1)n(n+4) 2)n^2+4 3)$3n^2-2$ 4)$3n^2+2$

4. $\underline{3}+\underline{15}+\underline{63}+$ …… n terms =
   4 16 64
   1)$n-\frac{1}{3}4^n-\frac{1}{3}$ 2)$n+\frac{1}{3}4^{-n}-\frac{1}{3}$ 3)$n+\frac{1}{3}4^n-\frac{1}{3}$ 4)$n-\frac{1}{3}4^{-n}+\frac{1}{3}$

5. $1^3+1+2^3+2+3^3+3+\ldots..2n$ terms=

1) $\frac{n(n+1)(n+2)(n+3)}{4}$ 2) $\frac{n(n+1)(n^2+2n+2)}{4}$ 3) $\frac{n(n+1)(n+3)(2n+1)}{4}$ 4) $\frac{n(n+1)(n^2+n+2}{4}$

6. 1/1.6 +1/6.11 +1/11.16 + …….. n terms=
   1)5/5n+1 2)n/5n+1 3)6/6n+1 4)n/6n+1

7. (1-1/2) (1-1/3) (1- /4) ……(1- 1/n) (n≥2)
   1)$1/n^2$ 2)$1/n^3$ 3)2/n 4)1/n

8. 1+(1+2)+(1+2+3)+ …n terms=
   1)n(n+1)(n+2)/6 2)n(n+1)(n+2)/3 3)n(n+1(2n+3)/6 4)n(n2+1)/6

9. 1.4+2.5+3.6+ …. n terms=
   1)n(n+1)(n+4)/9 2)n(n+1)(n+3)/9 3)n(n+1)(n+5)/3 4)n(n+1)(2n+3)/6

10. 2.5+5.8+8.11+….. n terms =
    1) n(3n2+6n+1) 2)3n(n2+2n+1) 3) $\frac{3n}{2}$(n2+4n-1) 4) $\frac{3}{2}$n(n2+4n+1)

11. 1.5+2.8+3.9+…… n terms=
    1)n(n+1)(2n+3)/2 2)n(n+2)(2n+1)/2 3)n(n+1)(n+2)/3 4)n(n+1)(n+3)/3

12. 4+8+12+16+ …. n terms=
    1)n(n+1) 2)2n(n+1) 3)4n(n+1) 4)$n^2/2$

13. If 49^n+16n-1 is divisible by x where x is the largest positive integer then x=
    1)4 2)16 3)64 4)128

14. $1^2+(1^2+2^2)+(1^2+2^2+3^2)+$ ……. to n terms=
    1) $\frac{n(n+1)^2(n+2)}{12}$ 2) $\frac{n(n+1)(n+2)}{12}$ 3) $\frac{n(n+1)(n+2)^2}{12}$ 4)n-1

15. For all nεN $2.4^{(2n+1)}+3^{(3n+1)}$ is divisible by
    1)25 2)36 3)11 4)16

16. The product of r consecutive integers is divisible by
    1)r 2)r^r 3)⌊r 4)⌊(r-1)

17. Let S(k)=1+3+5+….+(2k-1)=3+k^2. Then which of the following is true?
    1)S(1) is correct 2)S(k)≠S(k+1) 3)S(k)⇒S(k+1)
    4)principle of mathematical induction can be used to prove the formula

KEY

1)3 2)2 3)4 4)2 5)4 6)2 7)4 8)1 9)3 10)1
11)1 12)2 13)3 14)1 15)3 16) 17)3

3. MATRICES

1. Matrix: - A rectangular array of numbers having 'm' rows and 'n' columns is called a matrix of order m by n.

2. Square matrix: If m = n then it is known as square matrix.

3. Rectangular matrix: If $m \neq n$ then it is known as rectangular matrix.

4. Row matrix: If only one row is present (m = 1) in a matrix then it is known as row matrix.

5. Column matrix: If only one column is present (n=1) in a matrix then it is known as column matrix.

6. Equal matrices: same type, same order and corresponding elements are equal.

7. Null matrix or Zero matrix: all the elements are zero.

8. Principal diagonal: In a matrix all those elements a_{ij} for which i=j is called elements of principle diagonal.

9. Diagonal matrix: The square matrix is called diagonal matrix if all the elements of a matrix are zero except those of principal diagonal matrix.

10. Trace: Sum of the principal diagonal elements of a square matrix is called trace of the matrix.
    Trace(A+B)= TraceA+TraceB.
    Trace (KA)= KTraceA

11. Scalar matrix : A diagnal matrix in which the diagonal elements are equal all other elements being zero is called scalar matrix.

12. Identity or Unit matrix (I): In Scalar matrix if the diagonal elements are unity then it is identity matrix.

13. Determinant of matrix: The determinant of the square matrix

    $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is the unique number[determinant = ad-bc].

14. The determinant of a square matrix is the sum of the product of the element of any column (row)with there corresponding cofactors.

15 Singular matrix: det=0

16. Non-Singular matrix: $\det \neq 0$

17. Idempotent matrix: A square matrix A is said to be idempotent matrix if $A^2=A$

18. Nilpotent matrix: - for square matrix A if $A^n=0$, then A is called nilpotent matrix.

19. Involuntary matrix: - A square matrix A is said to be involuntary matrix $A^2=I$

20. Transpose of matrix: - The matrix obtained from a given matrix A by interchanging its rows and columns is called transpose of the matrix A.
    1) $(A^T)^T = A$
    2) $(A+B)^T = A^T + B^T$
    3) $(AB)^T = B^T . A^T$
    4) $(ABC)^T = C^T B^T A^T$

21. Orthogonal matrix: - A square matrix A is said to be orthogonal matrix if $AA^T = A^TA = I$.

22. Symmetric matrix :- A square matrix A is symmetric if $A^T = A$

23. Skew-Symmetric matrix :- $A^T = -A$

24. Addition of two matrices are possible if they are of same type and order.

25. Rules for Multiplication:- The product of two matrices A and B are possible if No. of columns of A= No. of Rows of B.

26. Conjugate of a matrix :- The matrix obtained from any given matrix A on replacing its elements by conjugate complex number

    is called conjugate of A and is written as. $\overline{A}$

27. Adjoint matrix: - Let A be a square matrix. The transpose of matrix obtained from A by replacing the elements of A by cofactors is called the adjoint of A.

28. Inverse of a matrix: - If AB = BA= I then B is called inverse of A and $B=A^{-1}$

29. Commutative: - (commute) If A and B are such that AB=BA then A and B are commutative.

30. Anti-commute:- If A and B are such that AB= - BA then matrices A and B are anti-commutative.

31. The determinant of a triangular matrix is the product of the elements of the principal diagonal of the matrix.

32. Minor of an element in a square matrix.

Let $A=\begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$

then the minor a_{11} is $M_{11}=\begin{pmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{pmatrix}=a_{22}a_{33}-a_{32}a_{23}$

33. Cofactor of an element:- the cofactor of an element which is in the ith row and j^{th} column is equal to its minor multiplied by $(-1)^{i+j}$

Cofactor of a_{23} is $A_{23}=(-1)^{2+3}M_{23}=-\begin{vmatrix} a_{11} & a_{12} \\ a_{31} & a_{32} \end{vmatrix}$

34. Difference of two matrices if A and B are two matrices of the same type then A-B is defined by A+(-B).

35. Addition of matrices is closure, associative posses additive identity, inverse and commutative.

36. Multiplication is Associative, commutative posses multiplicative identity and inverse of matrix.

37. If A is a square matrix its transpose is A^T, P is symmetric matrix, Q is a skew symmetric matrix, then

$P+Q=1/2[A+A^T]+1/2[A-A^T]=A.$

38. Every square matrix can be expressed as the sum of a symmetric matrix and skew symmetric matrix.

39. Unit matrix is Singular.

40. $A^{-1} = \text{adj}A /|A|$

41. $\text{Adj } A=|A|A^{-1}$

42. $|\text{Adj}A|=|A|^{n-1}$

43. $\text{Det}(A^{-1})=(\det A)^{-1}$

44. For any scalar k, $\text{Adj}|kA|=k^{n-1}\text{Adj } A$.

45. $|\text{Adj Adj } A|=|A|^{(n-1)^2}$

46. $|\text{Adj Adj Adj } A|=|A|^{(n-1)^2}$

47. If A and B are two non-singular matrix of the same type then $\text{Adj}(AB)=(\text{Adj } B)(\text{Adj } A)$

48. $|\text{Adj } AB|=|\text{Adj}A||\text{Adj } B|$

49. If $\det A=\alpha+i\beta$ then $\det \overline{A}=\alpha-i\beta$.

50. If A is skew symmetric matrix of odd order then det A=0.

51. Let A be a n x n matrix then (i)det A=det A^T (ii)det(kA)= $k^n|A|$
52. The determinant of skew symmetric matrix of odd order is zero.
53. The determinant of a skew symmetric matrix of order three is zero.
54. The no. of elements in a det of order n is n^2.
55. If A is a square matrix of type n then det(Adj A) =$(\det A)^{n-1}$.
56. If A is invertible matrix then $\det(A^{-1}) = \frac{1}{\det A}$.
57. The inverse of a symmetric matrix is symmetric
58. The inverse of a diagonal matrix is a diagonal matrix.
59. **AUGUMENTED MATRIX:**

i) The Augmented matrix can be reduced into the form $\begin{pmatrix} 1 & 0 & 0 & \alpha \\ 0 & 1 & 0 & \beta \\ 0 & 0 & 1 & \gamma \end{pmatrix}$

then $x=\alpha$, $y=\beta$, $z=\gamma$ are the solutions.

.

ii) The Augmented matrix is reduced to the form $\begin{pmatrix} P_1 & P_2 & P_3 & P_4 \\ 0 & P_5 & P_6 & P_7 \\ 0 & 0 & P_8 & P_9 \end{pmatrix}$

by using elementary trans-formation is known as Echelon form of a matrix.

Case-I If $P_8 \neq 0$ then AX=D has UNIQUE SOLUTION

Case-II If $P_8=0, P_9 \neq 0$ then AX=D has NO SOLUTION

Case-III If $P_8=0, P_9=0$ and either $P_5 \neq 0$ or $P_6 \neq 0$ then AX=D has INFINITELY MANY SOLUTION

Case-IV If $P_5=P_6=P_8=P_9=0$ and $P7 \neq 0$ then AX=D has NO SOLUTION.

EXERCISE-A

1. If $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ then A^5=

1)243A 2)81A 3)81I 4)27I

2. The additive inverse of $\begin{bmatrix} 4 & 5 & 6 \\ -1 & 3 & 0 \\ -2 & -3 & 5 \end{bmatrix}$ is

1) $\begin{bmatrix} 4 & 5 & 6 \\ -1 & 3 & 0 \\ -2 & -3 & 5 \end{bmatrix}$ 2) $\begin{bmatrix} 4 & 5 & 6 \\ -1 & 3 & 0 \\ -2 & -3 & 5 \end{bmatrix}$

3) $\begin{bmatrix} 4 & 5 & 6 \\ -1 & 3 & 0 \\ -2 & -3 & 5 \end{bmatrix}$ 4) $\begin{bmatrix} 4 & 5 & 6 \\ -1 & 3 & 0 \\ -2 & -3 & 5 \end{bmatrix}$

3. If the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & \lambda \end{bmatrix}$ is singular, then $\lambda =$

(1) 5 (2) 4 (3) 3 (4) 2

4. If A is 2x2 matrix such that A =[a_{ij}], where a_{ij}=i-j, then the matrix 'A' is

1) $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ 2) $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$ 3) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ 4) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

5. $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix} = x + iy$, then

1) x = 3, y = 1 2) x = 1, y = 3 3) x = 0, y = 3 4) x = 0, y = 0

6. If A = $A = \begin{bmatrix} C & 2a \\ 2b & C \end{bmatrix}$ and A =A^T , then which of the following is true?

1)a=b 2)a+b 3)a+b=1 4)a=2b

7. If the orders of the matrices, A,B and C are 1x3,*x* x y, and 2 x *z* respectively and the order of (AB)C is 1x4 then product of *x,y,z* values is

1)10 2)12 3)24 4)48

8. The mirror of 2 and –5 in the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & -5 \\ -1 & 0 & -2 \end{bmatrix}$

1)5,2 2)-5,2 3)-5,-2 4)5,-2

9. The cofactors of 2 and –5 in the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & -5 \\ -1 & 0 & -2 \end{bmatrix}$

1)5,2 2)-5,2 3)-5,-2 4)5,-2

10. $\begin{bmatrix} 0 & b & -c \\ -b & 0 & a \\ c & -a & 0 \end{bmatrix} =$

1)0 2)1 3)2 4)-1

11. If $\begin{bmatrix} x & y & z \\ -x & y & z \\ x & -y & z \end{bmatrix} = kxyz, \quad then \quad k =$

1)1 2)3 3)4 4)2

12. If a≠6,b,c satify $\begin{bmatrix} a & 2b & 2c \\ 3 & b & c \\ 4 & a & b \end{bmatrix} = 0 \quad then \quad abc =$

1)a+b+c 2)0 3)b^3 4)ab+bc

13 If A is a 3x3 matrix and det(3A)=K(det(A)) then K =

1)9 2)6 3)1 4)27

14. If A= $\begin{pmatrix} 1 & 3 & 0 \\ -1 & 2 & 1 \\ 0 & 0 & 2 \end{pmatrix}$ and B= $\begin{pmatrix} 2 & 3 & 4 \\ 1 & 2 & 3 \\ -1 & 1 & 2 \end{pmatrix}$ then AB=_____

1) $\begin{pmatrix} 5 & 8 & 13 \\ 1 & 2 & 0 \\ 2 & -2 & 4 \end{pmatrix}$ 2) $\begin{pmatrix} 5 & -1 & 2 \\ 9 & 2 & 2 \\ 13 & 4 & 4 \end{pmatrix}$ 3) $\begin{pmatrix} 5 & -1 & -2 \\ 9 & 2 & 2 \\ 13 & 4 & 4 \end{pmatrix}$ 4) $\begin{pmatrix} 5 & 9 & 13 \\ -1 & 2 & 4 \\ -2 & 2 & 4 \end{pmatrix}$

15. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then A^4= _____

1) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ 2) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ 3) $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$ 4) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

16. A matrix whose inverse is itself is

1) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ **2)** $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ 3) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix}$ 4) $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$

17. The inverse of the matrix $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ is

1) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ 2) $\begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$ 3) $\begin{bmatrix} 0 & 0 & -1 \\ 0 & 1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$ 4) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

18. The inverse of $\begin{pmatrix} 3 & 5 & 7 \\ 2 & -3 & 1 \\ 1 & 1 & 2 \end{pmatrix}$ is

1) $\begin{pmatrix} 7 & 3 & -5 \\ 3 & 1 & -2 \\ -26 & -11 & 19 \end{pmatrix}$ 2) $\begin{pmatrix} 3 & 7 & -26 \\ 1 & 3 & -11 \\ -2 & -5 & 19 \end{pmatrix}$ 3) $\begin{pmatrix} 7 & 3 & -26 \\ 3 & 1 & -11 \\ -5 & -2 & 19 \end{pmatrix}$ 4) $\begin{pmatrix} 7 & -5 & 3 \\ 3 & -2 & 1 \\ 19 & -11 & -26 \end{pmatrix}$

19. If $\begin{vmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{vmatrix} = k \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ then k=____

1)1 2)2 3)4 4)8

20. If A= $\begin{pmatrix} x & 1 \\ 0 & 0 \end{pmatrix}$ and A^2=I, then x=_____

1)0 2)1 3)2 4)4

21. If the trace of the matrices A and B are 20 and -8, then the trace of (A+B) =___

1)160 2)6 3)12 4)4

22. $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & \lambda \end{bmatrix}$ is singular, then λ=_____

1)5 2)4 3)3 4)2

23. If A is a square matrix satisfying the equation $A^2-4A-5I=0$, then A^{-1}=___

1)$-A^2+4A+5I$ 2) $A-4I$ 3) $\frac{A-4I}{3}$ 4) $\frac{A-4I}{5}$

24. The system of equation 3x-2y+z=0, λx-14y+15z=0 and x+2y+3x=0 has non – trivial solution. Then λ=___

1)-2 2)-9 3)13 4)29

25. If $A=\begin{pmatrix}1 & -1\\ -1 & 1\end{pmatrix}$, $B=\begin{pmatrix}2 & -1\\ 1 & -2\end{pmatrix}$, then 2A-B=____

1)$\begin{pmatrix}0 & -1\\ -3 & 2\end{pmatrix}$ 2) $\begin{pmatrix}4 & -1\\ -3 & 4\end{pmatrix}$ 3) $\begin{pmatrix}0 & -1\\ -2 & 4\end{pmatrix}$ 4) $\begin{pmatrix}0 & -1\\ -3 & 4\end{pmatrix}$

26. If $A=\begin{pmatrix}1 & 4\\ 2 & 3\end{pmatrix}$, $B=\begin{pmatrix}-1 & 0\\ 1 & -2\end{pmatrix}$, then $(A+B)^T$=____

1) $\begin{pmatrix}0 & -3\\ 4 & 1\end{pmatrix}$ 2) $\begin{pmatrix}0 & 3\\ -4 & 1\end{pmatrix}$ 3) $\begin{pmatrix}0 & 3\\ 4 & 1\end{pmatrix}$ 4) $\begin{pmatrix}0 & 3\\ 4 & -1\end{pmatrix}$

27. If A= $\begin{pmatrix}1 & -1\\ 0 & 1\\ 2 & 3\end{pmatrix}$, B= $\begin{pmatrix}2 & 1\\ 3 & 0\\ 0 & 1\end{pmatrix}$ and 2A-3B+5x=0, then X=___

1) $\begin{pmatrix}4 & 5\\ 9 & -2\\ -4 & -2\end{pmatrix}$ 2) $\begin{pmatrix}2 & 5/2\\ 9/2 & -1\\ -2 & -1\end{pmatrix}$ 3) $\begin{pmatrix}4/3 & 5/3\\ 3 & 2/3\\ -4/5 & -2/3\end{pmatrix}$ 4) $\begin{pmatrix}4/5 & 1\\ 9/5 & -2/5\\ -4/5 & -3/5\end{pmatrix}$

28. α,β,γ are the cube roots of 8 then $\begin{vmatrix}\alpha & \beta & \gamma\\ \beta & \gamma & \alpha\\ \gamma & \alpha & \beta\end{vmatrix}=$

1)0 2)1 3)8 4)2

29. $\begin{vmatrix}11 & 12 & 13\\ 12 & 13 & 14\\ 13 & 14 & 15\end{vmatrix}=$

1)-1 2)0 3)1 4)2

30. If ω is a cube root of unity, then $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix} =$

1)0 2)1 3) ω 4)ω^2

31. $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix} =$

1)240 2)142 3)8 4)-8

32. $\begin{vmatrix} x & 1 & y+z \\ y & 1 & z+x \\ z & 1 & x+y \end{vmatrix} =$_____

1)0 2)xyz 3)x+y+z 4)x+y+z+1

33. If $\Delta_1 = \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$, $\Delta_2 = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$, then

1)$\Delta_1=\Delta_2$ 2)$\Delta_1=2\Delta_2$ 3)$2\Delta_1=\Delta_2$ 4)$\Delta_1=\Delta_2^2$

34. If $\Delta_1 = \begin{vmatrix} x & a & b \\ b & x & a \\ a & b & x \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$

1)$\Delta_1=3(\Delta_2)$ 2)$\Delta_1=3(\Delta_2)^2$ 3)$d/dx(\Delta_1)=3(\Delta_2)$ 4)$d/dx(\Delta_1)=3(\Delta_2)^2$

35. If $\begin{vmatrix} \frac{a^2+b^2}{c} & c & c \\ a & \frac{b^2+c^2}{a} & a \\ b & b & \frac{c^2+a^2}{b} \end{vmatrix}$ = k.abc, then k=_____

1)4 2)3 3)2 4)1

36. If $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = k(a+b+c)^2$, then k=____

1)2(a+b+c) 2)-2(a+b+c) 3)a+b+c 4)2abc

37. If a,b,c are the p-th, q-th and r-th terms respectively of a G.P., then

$\begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix} =$ _____

1)-1 2)0 3)1 4)p+q+r

38. If $n \in N$, $A = \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$, then A^n=____

1) $\begin{pmatrix} 1 & n \\ 0 & 1 \end{pmatrix}$ 2) $\begin{pmatrix} 2 & n \\ 0 & 1 \end{pmatrix}$ 3) $\begin{pmatrix} 1 & 2n \\ 0 & 1 \end{pmatrix}$ 4) $\begin{pmatrix} 1 & n \\ 0 & 2 \end{pmatrix}$

39. The adjoint of the matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is

1) $\begin{pmatrix} b & c \\ a & d \end{pmatrix}$ 2) $\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$ 3) $\begin{pmatrix} c & -a \\ -d & b \end{pmatrix}$ 4) $\begin{pmatrix} -d & c \\ b & a \end{pmatrix}$.

40. If $\begin{pmatrix} 2 & -1 & 4 \\ x & 0 & 1 \\ 1 & 2 & 0 \end{pmatrix}$ is a singular matrix, then x=_____

1)1/8 2)3/8 3)5/8 4)7/8

41. If A is a square matrix of order 3 such that A (AdjA) = $\begin{pmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{pmatrix}$,

then |AdjA|=_____

1)2 2)4 3)8 4)16

42. If A is a non-singular square matrix of order nxn, then det(Adj A)=_____

1)det A 2)$(\det A)^{n-1}$ 3)$(\det A)^{n}$ 4)$(\det A)^{n+1}$

43. If A is a 3x3 matrix and |A| = 10, then det (Adj A)=_____

1) 2)10 3)100 4)1000

44. If $A^{-1} = \frac{1}{3}\begin{pmatrix} 1 & 4 & -2 \\ -2 & -5 & 4 \\ 1 & -2 & 1 \end{pmatrix}$ and |A| =3, then Adj A=_____

1) $\begin{pmatrix} 1 & -2 & 1 \\ 4 & -5 & -2 \\ -2 & 4 & 1 \end{pmatrix}$ 2) $\begin{pmatrix} 1 & 2 & 1 \\ -4 & -5 & 2 \\ -2 & -4 & 1 \end{pmatrix}$ 3) $\begin{pmatrix} 1 & 4 & -2 \\ \frac{1}{9} & -2 & -5 \\ -1 & -2 & 4 \end{pmatrix}$ 4) $\begin{pmatrix} 1 & 4 & -2 \\ -2 & -5 & 4 \\ 1 & -2 & 1 \end{pmatrix}$

45. $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix}$ = _____

1)0 2)1 3) log xyz 4) $\log_y x$

46. A factor of $\begin{vmatrix} a & b-c & c+b \\ a+c & b & c-a \\ a-b & b+a & c \end{vmatrix}$ is

1)a-b-c 2)$(a+b+c)^2$ 3)abc 4)$a^2+b^2+c^2$

47. The solution of the system of equations whose augmented matrix is

$\begin{pmatrix} 1 & 1 & 1 & 9 \\ 2 & 5 & 7 & 52 \\ 2 & 1 & -1 & 0 \end{pmatrix}$, is

1)x=1,y=3,z=5 2)x=3,y=1.z=5 3)x=3,y=5,z=1 4)x=1,y=3,z=1

48. The equations x+2y-z=3,3x-y+2z=1,2x-2y+3z=2,x-y+z=-1, have
1)no solution 2)unique solution
3)infinitely many solutions 4)more than one but finite number of solutions

49. The equations x-y+2z=4, 3x+y+4z=6, x+y+z=1, have
1)no solution 2)unique solution
3)infinitely many solutions 4)more than one but finite number of solutions

50. If the system of equations x+y+z=6, x+2y+λz=0, x+2y+3z=10, have no solution, then λ= ____
1)2 2)3)4 4)5

51. The system of equations 3x-2y+z=0,λx-14y+15z=0 and x+2y-3z=0 has a non zero solution then λ=_____
1)0 2)1 3)3 4)5

52. The rank of the matrix A= $\begin{pmatrix} 1 & 4 & -1 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{pmatrix}$ is
1)3 2)2 3)1 4)0

53. The rank of the matrix A= $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$ is
1)3 2)2 3)1 4)0

54. The rank of the matrix A= $\begin{pmatrix} -1 & 2 & 3 \\ -2 & 4 & 6 \end{pmatrix}$ is
1)3 2)2 3)1 4)0

55. The rank of the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{pmatrix}$ is
1)3 **2)2** 3)1 4)0

56. Observe the following lists.

List-I	List-II
A)AB=A,BA=B then	1)det A≠0
B)A matrix ′A′ is invertivle	2)A^2=I
C)A is an involutory matrix	3)$A.A^T$=I
D) A is an orthogonal matrix	4)A^2=0

	A	B	C	D		A	B	C	D
1)	4	1	3	2	2)	4	1	5	3
3)	4	1	2	3	4)	1	2	3	4

57. Arrange the following matrices in ascending order of value of their trace.

1) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ **2)** $\begin{pmatrix} 2 & 3 & 1 \\ 1 & -1 & 2 \\ 3 & 0 & 1 \end{pmatrix}$ 3) $\begin{pmatrix} 3 & 4 \\ 1 & 5 \end{pmatrix}$ 4) $\begin{pmatrix} -2 & 1 \\ 3 & 8 \end{pmatrix}$

58. If $A = \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$; $KA = \begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$ then (k,a,b)=

1)(-6,-4,-9) 2)(6,4,9) 3)(-6,-4,9) 4)(6,4,-9)

59. If $\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix}\begin{bmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{bmatrix} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$ then

1)a =1, b =1 2) $a = \cos 2\theta, b = \sin 2\theta$

3) $a = Sin2\theta, b = \cos 2\theta$ 4) a=0,b=0

60. If A and B are square matrices of size $n \times n$ such that $A^2 - B^2 = (A-B)(A+B)$, then which of the following will be always true?

1)either of A or B is a zero matrix 2)either of A or B is an identity matrix

3)A =B 4)AB = BA

61. If $A = \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 2 \\ 3 \\ -1 \end{bmatrix}$ then $\left(A + B^T\right)^T =$

1) $\begin{bmatrix} 3 \\ 5 \\ 2 \end{bmatrix}$ 2) $\begin{bmatrix} 3 & 3 & 1 \end{bmatrix}$ 3) $\begin{bmatrix} 2 & 2 & 2 \end{bmatrix}$ 4) $\begin{bmatrix} 0 & 0 & 0 \end{bmatrix}$

62. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then $(2A)\left(\frac{1}{4}A'\right) =$

1) $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$ 2) $\begin{bmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{bmatrix}$ 3) $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$ 4) $\frac{1}{4}\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$

63. If $5A = \begin{bmatrix} 3 & -4 \\ 4 & x \end{bmatrix}$ and $AA^T = A^TA = I$ then x =

1)2 2)1 3)3 4)5

64. $\begin{bmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{bmatrix} =$

1) $a^2b^2c^2$ 2) $2a^2b^2c^2$ 3) $3a^2b^2c^2$ 4) $4a^2b^2c^2$

65. $\begin{bmatrix} b^2-ab & b-c & bc-ac \\ ab-a^2 & a-b & b^2-ab \\ bc-ac & c-a & ab-a^2 \end{bmatrix} =$

1)0 2)abc 3)a+b+c 4)ab+bc+ca

66. If a,b,c are all different and $\begin{bmatrix} a & a^2 & a^3-1 \\ b & b^2 & b^3-1 \\ c & c^2 & c^3-1 \end{bmatrix} = 0$ then *abc(ab+bc+ca)* =

1)*a+b+c =0* 2)*abc =0* 3)*a+b+c =1* 4)*ab+bc+ca =0*

67. If *a ≠4,b,c* satisfy $\begin{bmatrix} a & 2b & 2c \\ 2 & b & c \\ 3 & a & b \end{bmatrix} = 0$ then ac =

1)*a+b+c* 2)*0* 3)b^2 4)b^3

68. If the matrix $\begin{bmatrix} x & b & b \\ 1 & 1 & 1 \\ 0 & x & a \end{bmatrix}$ is singular, then x =

1)1 2)-3 3)*a,b* 4)0

69. A: A,B are two matrices then AB need not be equal to BA
R: Matrix multiplication is associative
The correct answer is
1)Both A and R are true R is correct explanation to A
2)Both A and R are true but r is not correct explanation to A
3)A is true R is false 4) A is false R is true

70. A: $\begin{vmatrix} 0 & p-e & e-r \\ e-p & 0 & r-p \\ r-e & p-r & 0 \end{vmatrix} = 0$
R: The determinant of a skew symmetric matrix is zero.
The correct answer is

1)Both A and R are true R is correct explanation to A
2)Both A and R are true but r is not correct explanation to A
3)A is true R is false 4) A is false R is true

71. a : The matrix A= $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 1 & 0 & 2 \end{pmatrix}$ is invertible

R: AB=0 $\Rightarrow$A=0 or B=0

The correct answer is
1)Both A and R are true R is correct explanation to A
2)Both A and R are true but r is not correct explanation to A
3)A is true R is false 4) A is false R is true

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72. If $a\neq 6$, b,c satisfy $\begin{vmatrix} a & 2b & 2c \\ 3 & b & c \\ 4 & a & b \end{vmatrix}$ =0 then abc=___ (2000)

1)a+b+c 2)0 3)b^3 4)ab+bc

73. If A and B are two square matrices such that B=-A^{-1}BA then $(A+B)^{2=}$___ (2000)

1)0 2)A^2+B^2 3)$A^2+2AB+B^2$ 4)A+B

74. If d is the determinant of a square matrix A of order n, then the determinant of its adjoint is =_ (2000)

1)d^n 2)d^{n-1} 3)d^{n-2} 4)d

75. If A= $\begin{matrix} 0 & 2 \\ 3 & -4 \end{matrix}$, kA= $\begin{matrix} 0 & 3a \\ 2b & 24 \end{matrix}$ then the values of k,a,b are respectively(2001)

1)-6,-12,-18 2)-6,4,9 3)-6,-4,-9 4)-6,12,18

76. A square matrix (a_{ij})=0 for $i\neq j$ and a_{ij}=k (constant) for i=j is called a (2001)

1)Unit matrix 2)Scalar matrix 3)Null matrix 4)Diagonal matrix

77. If A= $\begin{pmatrix} 2 & 2 \\ -3 & 2 \end{pmatrix}$, B= $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$, then $(B^{-1}A^{-1})^{-1}$=_____ (2001)

1) $\begin{pmatrix} 2 & -2 \\ 2 & 3 \end{pmatrix}$ 2) $\begin{pmatrix} 3 & -2 \\ 2 & 2 \end{pmatrix}$ 3) $\frac{1}{10}\begin{pmatrix} 2 & 2 \\ -2 & 3 \end{pmatrix}$ 4) $\frac{1}{10}\begin{pmatrix} 3 & 2 \\ -2 & 2 \end{pmatrix}$

78. If A,B are square matrices of order 3. A is non-singular and AB=0 then B is a (2002)

1) Null matrix 2)Non-singular matrix 3)singular matrix 4)Unit matrix
(question deleted by EAMCET convener)

79. If A= $\begin{pmatrix} 1 & 0 & 1 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{pmatrix}$ then det A =____ (2002)

1)2 2)3 3)4 4)5

80. $\begin{vmatrix} 1990 & 1991 & 1992 \\ 1991 & 1992 & 1993 \\ 1992 & 1993 & 1994 \end{vmatrix} =$ ___ (2004)

1)1992 2)1993 3)1994 4)0

81. Match the following elements of $\begin{pmatrix} 1 & -1 & 0 \\ 0 & 4 & 2 \\ 3 & -4 & 6 \end{pmatrix}$ with their cofactors and choose the correct answer. (2004)

Element	Cofactor
I. -1	a)-2
II. 1	b)32
III. 3	c)4
IV. 6	d)6
	e)-6

1)b,d,a,c 2)b,d,c,a 3)d,b,a,c 4)d,a,b,c

82. The rank of $\begin{pmatrix} 1 & -1 & 1 \\ 1 & 1 & -1 \\ 1 & 1 & 1 \end{pmatrix}$ is (2004)

1)0 2)1 3)2 4)3

83. $m[-3\ \ 4] + n[4\ \ -3] = [10\ \ -11] \Rightarrow 3m+7n=$_____ (2005)

1)3 2)5 3)10 4)1

84. $\text{Adj}\begin{pmatrix} 1 & 0 & 2 \\ -1 & 1 & -2 \\ 0 & 2 & 1 \end{pmatrix} = \begin{pmatrix} 5 & a & -2 \\ 1 & 1 & 0 \\ -2 & -2 & b \end{pmatrix} \Rightarrow [a\ \ b] =$____ (2005)

1)[-4 1] 2)[-4 -1] 3)[4 1] 4)[4 -1]

85. $A=\begin{pmatrix} -1 & 0 \\ 0 & 2 \end{pmatrix} \Rightarrow A^3-A^2$ (2005)

1)2A 2)2I 3)A 4)I

86. $A=\begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix} \Rightarrow A^3-4A^2-6A=$___ (2006)

1)0 2)A 3)-A 4)I

87. If A is an invertible matrix of order n, then the determinant of adj A is equal to:
1)$|A|^n$ 2)$|A|^{n+1}$ 3)$|A|^{n-1}$ 4)$|A|^{n+2}$ (2006)

88. $\begin{vmatrix} \log e & \log e^2 & \log e^3 \\ \log e^2 & \log e^3 & \log e^4 \\ \log e^3 & \log e^4 & \log e^5 \end{vmatrix}$ (2006)

1)0 2)I 3)4 loge 4)5 loge

89. If A is a square matrix such that $A(\text{adjA}) = \begin{pmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{pmatrix}$ then $|\text{adjA}| =$_____

(2007)

1)4 2)16 3)64 4)256

90. If $\begin{pmatrix} 1 & 2 & x \\ 4 & -1 & 7 \\ 2 & 4 & -6 \end{pmatrix}$ is a singular matrix, then x = **(2007)**

1)0 2)1 3)-3 4)3

91. The number of nontrivial solutions of the system: *x-y+z =0,x=2y-z =0, 2x+y+3z =0* is

1)0 2)1 3)2 4)2 [2007]

92. If A=$\begin{pmatrix} 1 & -2 \\ 4 & 5 \end{pmatrix}$ and f(t)=t^2-3t+7 then f(A)+ $\begin{bmatrix} 3 & 6 \\ -12 & -9 \end{bmatrix}$=

1) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ 2) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ 3) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ 4) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ (2008)

93. The inverse of the matrix is $\begin{bmatrix} 7 & -3 & 3 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$ is (2008)

1) $\begin{bmatrix} 1 & 1 & 1 \\ 3 & 4 & 3 \\ 3 & 3 & 4 \end{bmatrix}$ 2) $\begin{bmatrix} 1 & 3 & 1 \\ 4 & 3 & 8 \\ 3 & 4 & 1 \end{bmatrix}$ 3) $\begin{bmatrix} 1 & 1 & 1 \\ 3 & 3 & 4 \\ 3 & 4 & 3 \end{bmatrix}$ 4) $\frac{1}{7}\begin{bmatrix} 1 & 3 & -3 \\ 1 & 10 & -3 \\ 1 & 3 & 4 \end{bmatrix}$

94. $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} =$ [2008]

1) 0 2) $a+b+c$ 3) $(a+b+c)^2$ 4) $(a+b+c)^3$

95. Let A and B be two symmetric matrices of same order. Then the matrix AB – BA is:

1) a symmetric matrix 2) a skew-symmetric matrix
3) a null matrix 4) the identity matrix
[2009]

96. If one of the roots of $\begin{vmatrix} 3 & 5 & x \\ 7 & x & 7 \\ x & 5 & 3 \end{vmatrix} = 0$ is –10, then the other roots are: [2009]

1) 3, 7 2) 4, 7 3) 3, 9 4) 3, 4

97.If x, y, z are all positive and are the pth, qth and rth terms of a geometric progression respectively, then the value of the determinant $\begin{vmatrix} \log x & p & 1 \\ \log y & q & 1 \\ \log z & r & 1 \end{vmatrix} =$ [2009]

1) log xyz 2) (p–1) (q–1) (r–1) 3) pqr 4) 0

98. If $\begin{vmatrix} 1 & -1 & x \\ 1 & x & 1 \\ x & -1 & 1 \end{vmatrix}$ has no inverse, then the real value of x is: [2010]

1) 2 2) 3 3) 0 4) 1

99. F(x) = $f(x) = \begin{vmatrix} 2\cos x & 1 & 0 \\ x-\frac{\pi}{2} & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix} \Rightarrow f'(\pi) =$ [2010]

1) 0 2) 2 3) $\frac{\pi}{2}$ 4) $\pi - 6$

100. $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0, x \neq y \neq z \Rightarrow 1 + xyz =$ _____ [2010]

1) 0 2) -1 3) 1 4) 2

101. If the system of equations :
$(k+1)^3x + (k+2)^3y = (k+3)^3$
$(k+1)\,x + (k+2)\,y = k+3$
$x + y = 1$
is consistent, then the value of k is : [2010]
1) 2 2) -2 3) -1 4) 1

102. If A is a nonzero square matrix of order n with $\det(I + A) \neq 0$ and $A^3 = 0$, where I, O are unit and null matrices of order $n \times n$ respectively then $(I + A)^{-1}$ = [2010]
1) $I - A + A^2$ 2) $I + A + A^2$ 3) $I + A^{-1}$ 4) I + A

103. $A(\alpha,\beta)=\begin{pmatrix}\cos\alpha & \sin\alpha & 0\\ -\sin\alpha & \cos\alpha & 0\\ 0 & 0 & e^{\beta}\end{pmatrix}\Rightarrow\left[A(\alpha,\beta)\right]^{-1}=$

(2011)

1) $A(-\alpha,\beta)$ 2) $A(-\alpha,-\beta)$ 3) $A(\alpha,-\beta)$ 4) $A(\alpha,\beta)$

104.If A is a matrix such that $\begin{pmatrix}2 & 1\\ 3 & 2\end{pmatrix}A\begin{pmatrix}1 & 1\end{pmatrix}=\begin{pmatrix}1 & 1\\ 0 & 0\end{pmatrix}$ then A = (2011)

1) $\begin{pmatrix}1 & 1\\ 0 & 1\end{pmatrix}$ 2) $\begin{pmatrix}2 & 1\end{pmatrix}$ 3) $\begin{pmatrix}1 & 0\\ -1 & 1\end{pmatrix}$ 4) $\begin{pmatrix}2\\ -3\end{pmatrix}$

105. $A=\begin{pmatrix}1 & 0 & 1\\ 0 & 1 & 1\\ 0 & 1 & 0\end{pmatrix}\Rightarrow A^2-2A=$

(2011)

1) A^{-1} 2) $-A^{-1}$ 3) I 4) –I

106. $\begin{vmatrix}24 & 25 & 26\\ 25 & 26 & 27\\ 26 & 27 & 27\end{vmatrix}=$ (2012)

1) 0 2) -1 3) 1 4) 2

107. Let $A=\begin{vmatrix}2 & e^{i\pi}\\ i^2 & i^{2012}\end{vmatrix}, C=\left.\frac{d}{dx}\left(\frac{1}{x}\right)\right|_{x=1}$ $and\ D=\int_{e^2}^{1}\frac{dx}{x}$ If the sum of two roots of the equation $Ax^3+Bx^2+Cx+D=0$ is equal to zero, then B = (2012)

1) – 1 2) 0 3) 1 4) 2

108. $A=\begin{bmatrix}i & -i\\ -i & i\end{bmatrix}, B=\begin{bmatrix}1 & -1\\ -1 & 1\end{bmatrix}\Rightarrow A^8=$

(2012)

1) 4B 2) 8B 3) 64B 4) 128B

109. $f(x)=\begin{vmatrix}1 & x & x+1\\ 2x & x(x-1) & x(x+1)\\ 3x(x-1) & x(x-1)(x-2) & (x-1)x(x+1)\end{vmatrix}\Rightarrow f(2012)=$

. (2012)

1) 0 2) 1 3) -500 4) 500

110. Let $A=\begin{bmatrix}-1 & -2 & -3\\ 3 & 4 & 5\\ 4 & 5 & 6\end{bmatrix}, B=\begin{bmatrix}1 & -2\\ -1 & 2\end{bmatrix}$ $and\ C=\begin{bmatrix}2 & 0 & 0\\ 0 & 2 & 0\\ 0 & 0 & 2\end{bmatrix}$ If a, b & c respectively denote the ranks of A, B & C then the correct order of these numbers is (2012)

1) a < b < c 2) c < b < a 3) b < a < c 4) a < c < b

111. Given that $a\alpha^2 + 2b\alpha + c \neq 0$ and that the system of equations $(a\alpha + b)x + ay + bz = 0$ $(b\alpha + c)x + by + cz = 0$ $(a\alpha + b)y + (b\alpha + c)z = 0$ has a non-trivial solutions, then a, b, c lie in (2012)

1) Arithmetic Progression 2) Geometric progression
3) Harmonic progression 4) Arithmetico – geometric progression

112. If $A = \begin{bmatrix} -8 & 5 \\ 2 & 4 \end{bmatrix}$ satisfies the equation $x^2 + 4x - p = 0$, then p = (2013)

1) 64 2) 42 3) 36 4) 24

113. $\begin{vmatrix} x+2 & x+3 & x+5 \\ x+4 & x+6 & x+9 \\ x+8 & x+11 & x+15 \end{vmatrix} =$ (2013)

1) $3x^2 + 4x + 5$ 2) $x^3 + 8x + 2$ 3) 0 4) – 2

114. The system of equations 3x + 2y + z = 6, 3x + 4y + 3z = 14, 6x + 10y +8z =a, has infinite number of solutions, if a = (2013)

1) 8 2) 12 3) 24 4) 36

115. The number of real values of t such that the system of homogeneous equation tx+(t+1)y+(t–1)z=0, (t+1)x+ty+(t+2)z=0, (t–1)x+(t+2)y+tz=0 has non –trivial solutions, is (2013)

1) 3 2) 2 3) 1 4) 4

116. If a, b, c & d are real numbers such that $a^2+b^2+c^2=1$ & if $A = \begin{bmatrix} a+ib & c+id \\ -c+id & a-ib \end{bmatrix}$ then A^{-1} (2014)

1) $\begin{bmatrix} a-ib & c+id \\ -c+id & a+ib \end{bmatrix}$ 2) $\begin{bmatrix} a-ib & -c-id \\ c-id & a+ib \end{bmatrix}$

3) $\begin{bmatrix} a+ib & c+id \\ c-id & a-ib \end{bmatrix}$ 4) $\begin{bmatrix} a+ib & -c-id \\ c-id & a-ib \end{bmatrix}$

117. If the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & \alpha \end{bmatrix}$ is of rank 3, then α = (2014)

1) 5 2) 4 3) 1 4) -5

118. If k > 1, & the determinant of the matrix A^2, where $A = \begin{bmatrix} k & k\alpha & \alpha \\ 0 & \alpha & k\alpha \\ 0 & 0 & k \end{bmatrix}$ is k^2 then |α|= (2014)

1) k 2) k^2 3) 1 / k 4) 1 / k^2

119. $A(x)=\begin{vmatrix} 1 & 2 & 3 \\ x+1 & 2x+1 & 3x+1 \\ x^2+1 & 2x^2+1 & 3x^2+1 \end{vmatrix}$ then $\Rightarrow \int_0^1 A(x)\,dx =$ (2015)

1) 0 2) 1 3) 2 4) 4

120. Let $\begin{vmatrix} x^2+x+1 & x+1 & 2x-3 \\ 3x^2 & x+2 & x-1 \\ x^2+5x+1 & 2x+3 & x+4 \end{vmatrix} = ax^4+bx^3+cx^2+dx$ be an identify in x. If a, b, c are known then the value of c is (2015)

1) 29 2) 24 3)16 4) 9

121. The system of equations 4x + y + 2z = 5, x – 5y + 3z = 10, 9x – 3y + 7z = 20 has (2015)

1) no solution 2) unique solution
3) two solutions 4) infinite number of solution

122. The value of the determinant $\begin{vmatrix} b^2-ab & b-c & bc-ac \\ ab-a^2 & a-b & b^2-ac \\ bc-ac & c-a & ab-a^2 \end{vmatrix}$ (2015 A.P.)

1) abc 2) a + b + c 3) 0 4) ab + bc + ca

123. If A is the square matrix of order 3, then $\left|Adj\left(Adj\,A^2\right)\right| =$ (2015 A.P.)

1) $|A|^2$ 2) $|A|^2$ 3) $|A|^8$ 4) $|A|^{16}$

124. The system 2x + 3y + z = 5, 3x + y + 5z = 7, x + 4y – 2z = 3 has (2015AP)

1) unique solution 2) finite number of solutions
3) Infinite solutions 4) no solutions

125. Consider the system of equation ax + by + cz = 2, bx + cy + az = 2, cx + ay + bz = 2 where a, b, c are real numbers such that a + b + c = 0 then the system (2016)

1) Has two solutions 2) Is inconsistent
3) Has unique solution 4) Has infinitely many solutions

126. Suppose A & B are two square matrices of same order. If A, B are symmetric matrices than AB – BA is (2016)

1) A symmetric matrix 2) A skew symmetric
3) A scalar matrix 4) A triangular matrix

127. $A(x)=\begin{vmatrix} x+1 & 2x+1 & 3x+1 \\ 2x+1 & 3x+1 & x+1 \\ 3x+1 & x+1 & 2x+1 \end{vmatrix}$ then $\int_0^1 A(x)\,dx =$ (2016)

1) -15 2) $\frac{-15}{2}$ 3) -30 4) -5

128. If a, b, c are distinct positive real numbers, then the value of the determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is (2016AP)

1) < 0 2) > 0 3) 0 4) ≥ 0

129. The equation x – y + 2z = 4, 3x + y + 4z = 6, x + y + z = 1 have (2016AP)

1) Unique solution 2) Infinitely many solution
3) No solution 4) Two solutions

130. If $A=\begin{bmatrix} 1 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & -1 & 4 \end{bmatrix}, A=B+C, B=B^T \,\&\, C=-C^T$, then C = (2017)

1) $\begin{bmatrix} 0 & 0.5 & 0 \\ -0.5 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ 2) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0.5 \\ 0 & -0.5 & 0 \end{bmatrix}$

3) $\begin{bmatrix} 0 & -0.5 & 0.5 \\ 0.5 & 0 & 0 \\ -0.5 & 0 & 0 \end{bmatrix}$ 4) $\begin{bmatrix} 0 & 0.5 & 0 \\ -0.5 & 0 & 0.5 \\ 0 & -0.5 & 0 \end{bmatrix}$

131. If $\Delta=\begin{vmatrix} 1 & 5 & 6 \\ 0 & 1 & 7 \\ 0 & 0 & 1 \end{vmatrix} \,\&\, \Delta^1=\begin{vmatrix} 1 & 0 & 1 \\ 3 & 0 & 3 \\ 4 & 6 & 100 \end{vmatrix}$, then (2017)

1) $\Delta^2-3\Delta^1=0$ 2) $\left(\Delta+\Delta^1\right)^2-3\left(\Delta+\Delta^1\right)+2=0$

3) $\left(\Delta+\Delta^1\right)^2+3\left(\Delta+\Delta^1\right)+5=0$ 4) $\Delta+3\Delta^1+1=0$

132. If $A=\begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$ where $\theta=\frac{2\pi}{19}$ then $A^{2017}=$ (2017AP)

1) A 2) A^3 3) A^5 4) I

133. If (α, β, γ) is the solution of the system of simultaneous linear equations given by 3x + 4y – 5z = - 6, 2x + 3y – 4z + 7 = 0, 4x – 2y + z = 9 then α + 3β – γ = (2017AP)

1) 4 2) 2 3) 3 4) 8

134. If A & B are two matrices given by $A=\begin{pmatrix}1&2&3\\2&3&4\\5&6&8\end{pmatrix}$ & $B=\begin{pmatrix}3&2&5\\2&3&8\\7&2&9\end{pmatrix}$ then, the value of |Adj (AB)| = (2017AP)

1) 24 2) 24^2 3) 24^3 4) 65

135. If rank of $\begin{pmatrix}x&x&x\\x&x^2&x\\x&x&x+1\end{pmatrix}$ is 1, then (2017)

1) x = 0 (or) x = 1 2) x = 1 3) x = 0 4) $x \neq 0$

KEY

1) 2	2) 4	3) 3	4) 1	5) 4	6) 1	7) 3	8) 2	9) 4	10) 1
11) 3	12) 3	13) 4	14) 4	15) 1	16) 2	17) 1	18) 3	19) 2	20) 1
21) 3	22) 3	23) 4	24) 4	25) 4	26) 3	27) 4	28) 1	29) 2	30) 1
31) 4	32) 1	33) 1	34) 3	35) 1	36) 1	37) 2	38) 3	39) 2	40) 3
41) 2	42) 2	43) 3	44) 4	45) 1	46) 4	47) 1	48) 1	49) 2	50) 2
51) 4	52) 1	53) 3	54) 3	55) 2	56) 3	57) 2	58) 1	59) 4	60) 1
61) 3	62) 2	63) 3	64) 4	65) 4	66) 1	67) 3	68) 3	69) 2	70) 3
71) 3	72) 3	73) 2	74) 2	75) 3	76) 2	77) 1	78) 1	79) 1	80) 4
81) 3	82) 4	83) 4	84) 3	85) 1	86) 3	87) 3	88) 1	89) 2	90) 3
91) 2	92) 2	93) 4	94) 4	95) 2	96) 1	97)	98) 4	99) 2	100)
101) 2	102) 1	103) 2	104) 4	105) 2	106) 2	107) 2	108) 4	109) 1	110) 3
111) 2	112) 2	113) 4	114) 4	115)1	116) 2	117)1	118) 3	119) 1	120) 1
121) 4	122) 3	123) 3	124)4	125)4	126)2	127)2	128)1	129)2	130)2
131)2	132)2	133)1	134)2	135)3					

EXERCISE-B

1. If A is an orthogonal matrix, then:

   1) |A|=0 2) |A| ± 1 3) |A|= ± 2 4) None of these

2. The inverse of a symmetric mstrix is:

   1) Symmetric 2) Skew symmetric 3) Diagonal matrix 4) None of these

3. The value of x which the matrix product $\begin{bmatrix}2&0&7\\0&1&0\\1&-2&1\end{bmatrix}\begin{bmatrix}-x&14x&7x\\0&1&0\\x&-4x&-2x\end{bmatrix}$ = an identity matrix is:

   1) $\frac{1}{2}$ 2) $\frac{1}{3}$ 3) $\frac{1}{4}$ 4) $\frac{1}{5}$

4. Let $F(\alpha)=\begin{bmatrix}\cos\alpha & -\sin\alpha & 0\\ \sin\alpha & \cos\alpha & 0\\ 0 & 0 & 1\end{bmatrix}$ Then, $F(\alpha)F(\alpha')=$

1) $F(\alpha\alpha')$ 2) $F\left(\frac{\alpha}{\alpha'}\right)$ 3) $F(\alpha+\alpha')$ 4) $F(\alpha-\alpha')$

5. The equation x+2y+3z=1, x-y+4z=0, 2x+y+7z=1 have

1) Only one solution 2) Only two solution

3) No solution 4) Infinitely many solutions

6. The inverse of the matrix $\begin{bmatrix}0.8 & 0.6\\ -0.6 & 0.8\end{bmatrix}$ is:

1) $\begin{bmatrix}0.8 & -0.6\\ 0.6 & 0.8\end{bmatrix}$ 2) $\begin{bmatrix}-0.8 & 0.6\\ -0.6 & 0.8\end{bmatrix}$

3) $\begin{bmatrix}-0.8 & -0.6\\ 0.6 & 0.8\end{bmatrix}$ 4) None of these

7. If $X=\begin{bmatrix}3 & -4\\ 1 & -1\end{bmatrix}$ the value of $X^n=$

1) $\begin{bmatrix}3n & -4n\\ n & n\end{bmatrix}$ 2) $\begin{bmatrix}2+n & 5-n\\ n & -n\end{bmatrix}$

3) $\begin{bmatrix}3^n & (-4)^n\\ 1^n & (-1)^n\end{bmatrix}$ 4) None of these

8. Let a, b, c be positive real numbers. The following system of equation in x, y & z $\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=1,\ \frac{x^2}{a^2}-\frac{y^2}{b^2}+\frac{z^2}{c^2}=1,\ -\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ has:

1) No solution 2) Unique solution

3) Infinitelty many solutions 4) Finitely many solutions

9. If $A=\begin{bmatrix}0 & 1 & 2\\ 1 & 2 & 3\\ 3 & a & 1\end{bmatrix}$ & $A^{-1}=\begin{bmatrix}1/2 & -1/2 & 1/2\\ 4 & 3 & c\\ 5/2 & -3/2 & 1/2\end{bmatrix}$ then

1) a=2, c=-1/2 2) a=1, c=-1 3) a=-1, c=1 4) a=1/2, c=1/2

10. The matrix $\begin{bmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{bmatrix}$ is a:

1) Skew symmetric matrix 2) Symmetric matrix

3) Null matrix 4) None of the above

11. $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 4 & 5 \end{bmatrix}$ & Trace(AB)= λ Trace(A)Trace(B) then $\lambda =$

1) 1 2) 0 3) $\frac{6}{5}$ 4) $\frac{20}{27}$

12. If *l, m, n* are direction cosines of a line & $A = \begin{bmatrix} l^2 & lm & ln \\ lm & m^2 & mn \\ ln & mn & n^2 \end{bmatrix}$ then A^2=

1) A 2) O 3) I 4) None of these

13. If the matrix $\begin{bmatrix} 0 & 2\beta & \gamma \\ \alpha & \beta & -\gamma \\ \alpha & -\beta & \gamma \end{bmatrix}$ is orthogonal then

1) $\alpha = \pm\frac{1}{\sqrt{2}}$ 2) $\beta = \pm\frac{1}{\sqrt{6}}$ 3) $\gamma = \pm\frac{1}{\sqrt{3}}$ 4) All the above

14. If $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^x = \begin{vmatrix} 2bc-a^2 & c^2 & b^2 \\ c^2 & 2ac-b^2 & b^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix}$ then x=

1) 1 2) 2 3) 3 4) ½

15. If $f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & x(x+1) \\ 3x(x-1) & (x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$ then f(100)=

1) 0 2) 1 3) 100 4) -100

16. If $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then the matrix A is

1) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$ 2) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ 3) $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ 4) $\begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}$

17. The Rank of $\begin{bmatrix} -1 & 2 & 5 \\ 2 & -4 & a-4 \\ 1 & -2 & a+1 \end{bmatrix}$ is

1) 3 if a= 6 2) 1 if a = - 6 3) 3 if a = 2 4) 2 if a = - 6

18. If A = $\begin{bmatrix} \frac{1}{3} & \frac{1}{3} \\ \frac{1}{3} & \frac{1}{3} \end{bmatrix}$ then I + A + A^2 + …….. ∞ =

1) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ 2) $\begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$ 3) $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$ 4) Undefined

19. If $\begin{vmatrix} x-1 & 5x & 7 \\ x^2-1 & x-1 & 8 \\ 2x & 3x & 0 \end{vmatrix} = ax^3 + bx^2 + cx + d$ then value of c is given by

1) -1 2) 12 3) 15 4) 17

20. If $\Delta = \begin{vmatrix} x & 2y-z & -z \\ y & 2x-z & -z \\ y & 2y-z & 2x-2y-z \end{vmatrix}$ then

1) (x-y) is a factor of Δ 2) $(x+y)^2$ is a factor of Δ
3) $(x-y)^3$ is a factor of Δ 4) Δ is independent of z

21. If $\begin{pmatrix} x-3 & 2y-8 \\ z+2 & 6 \end{pmatrix} = \begin{pmatrix} 5 & 2 \\ -2 & a-4 \end{pmatrix}$ then (a,2) =

1)(10,4) 2)(10,-4) 3)(-10,4) 4)(-10,-4)

22. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ then A^4 =

(a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

23. If A and B are two matrices such that $AB = B$ and $BA = A$ then $A^2 + B^2$ =
(a) $2AB$ (2) $2BA$ (3) $A + B$ (4) AB

24. The matrix whose inverse is it self is

(1) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ (2) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (3) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix}$ (4) $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$

25. If $A = \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$; $KA = \begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$ then (k,a,b)=

1)(-6,-4,-9) 2)(6,4,9) 3)(-6,-4,9) 4)(6,4,-9)

26. The system of equations $3x - 2y + z = 0$, $\lambda x - 14y + 15z = 0$, and $x + 2y + 3z = 0$ has a non-trivial solution. Then $\lambda =$
(1) –2 (2) –9 (3) 13 (4) 29

27. The system of linear equations $x + y + z = 2$, $2x + y - z = 3$ and $3x + 2y + kz = 4$ has unique solution if
(1) $k \neq 0$ (2) $-1 < k < 1$ (3) $-2 < k < 2$ (4) $k = 0$

KEY

1) 2	2) 1	3) 4	4) 3	5) 4	6) 1	7) -	8) 2	9) 2	10) 2
11) 4	12) 1	13) 4	14) 2	15) 1	16) 1	17) 2	18) 3	19) 4	20) 1
21) 2	22) 4	23) 3	24) 2	25) 1	26) 4	27) 1	28)	29)	30)

AIEEE PROBLEMS

1. If $A = \begin{pmatrix} a & b \\ b & a \end{pmatrix}$ and $A^2 = \begin{pmatrix} \alpha & \beta \\ \beta & \alpha \end{pmatrix}$, then **[2003]**
1) $\alpha = a^2 + b^2, \beta = 2ab$ 2) $\alpha = a^2 + b^2, \beta = a^2 - b^2$
3) $\alpha = 2ab$, $\beta = a^2 + b^2$ 4) $\alpha = a^2 + b^2$ $\beta = ab$

2. If $A = \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$ and $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then which one of the following holds for all $n \geq 1$, by the principle of mathematical induction **[2005]**
1) $A^n = nA - (n-1)I$ 2) $A^n = 2^{n-1}A - (n-1)I$
3) $A^n = nA + (n-1)I$ 4) $A^n = 2^{n-1}A + (n-1)I$

3. Let $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}$, $a, b \in IN$. Then **[2006]**
1) there exists exactly one B such that AB = BA
2) **there exist infinitely many B's such that AB = BA**
3) there cannot exist any B such that AB = BA
4) there exist more than one but finite number of B's such that AB = BA

4. If $1, \omega, \omega^2$ are the cube roots of unity, then $\Delta = \begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^n & \omega^{2n} & 1 \\ \omega^{2n} & 1 & \omega^n \end{vmatrix} =$ **[2003]**
1) 1 2) ω 3) ω^2 **4) 0**

5. If $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$ and vectors (1, a, a^2), (1, b, b^2) and (1, c, c^2) are non – coplanar , then the product abc = **[2003]**

1) -1 2) 1 3) 0 4) 2

6. If a_1, a_2, ……. Form a G.P and $a_i>0$, $\forall i \geq 1$, then

$\begin{vmatrix} \log a_m & \log a_{m+1} & \log a_{m+2} \\ \log a_{m+3} & \log a_{m+4} & \log a_{m+5} \\ \log a_{m+5} & \log a_{m+7} & \log a_{m+8} \end{vmatrix} =$ **[AIEEE 2004, 2005]**

1) $\log a_{m+8} - \log a_m$ 2) $\log a_m$ 3) $2\log a_{m+4}$ **4) none**

7. If $a^2 + b^2 + c^2 = -2$ and $f(x) = \begin{vmatrix} 1+a^2x & (1+b^2)x & (1+c^2)x \\ (1+a^2)x & 1+b^2x & (1+c^2)x \\ (1+a^2)x & (1+b^2)x & 1+c^2x \end{vmatrix}$ then f(x) is a polynomial of degree **[AIEEE 2005]**

1) 1 2) 0 3) 3 **4) 2**

8. If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1 \end{vmatrix}$ for $x \neq 0, y \neq 0$ then D is **[AIEEE 2007]**

1) Divisible by either x nor y **2) divisible by both a and y**
3) Divisible by x and y 3) divisible by y but not x

9. Let $A = \begin{pmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{pmatrix}$. If $|A^2| = 25$, then $|\alpha|$ equals **[AIEEE 2007]**

1) 5^2 2) 1 **3) 1/5** 4) 5

INVERSE MATRIX

1. Let $A = \begin{pmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{pmatrix}$. Then only correct statement about the matrix A is **[AIEEE 2004]**

1) A is a zero matrix **2) $A^2 = I$**
3) A^{-1} does not exist 4) A = (-1) I, Where I is a unit matrix

2. Let $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{pmatrix}$ and $(10)B = \begin{pmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{pmatrix}$. If B is the inverse of matrix A, then α is **[AIEEE 2004]**

1) -2 **2) 5** 3) 2 4) -1

<u>Linear Equations</u>

1. If the system of linear equations x + 2ay + az = 0 x + 3by +bz = 0, x + 4cy + cz = 0 has a non – zero solution, then a, b, c **[AIEEE 2003]**

   1) are in G. P. **2) are in H. P.**
   2) 3) satisfy a + 2b + 3c = 0 4) are in A.P.

2. The system of equation $\alpha x + y + z = \alpha - 1, x + \alpha y + z = \alpha - 1, x + y + \alpha z = \alpha - 1$ has no solution, if α is **[AIEEE 2005]**

   1) -2 2) either -2 or 1 3) not -2 4) 1

Vector Algebra

4. ADDITION OF VECTORS

1. A quantity which has both magnitude and direction is known as vector. Geometrically a directed line is called a vector.
   Example: velocity, acceleration etc.

2. A quantity which has only magnitude is called a scalar.
   Example: Mass, Temperature, density etc.

3. A vector having zero magnitude is called the null or zero vector. The zero vector is unique.
4. A vector whose magnitude is equal to one unit is called a unit vector.
   Let **a** be a non zero vector ($|a|\neq 0$) then
   a. Unit vector along(in the direction of) $a = a/|a|$
   b. Unit vector in the direction opposite to that of $= -a/|a|$
   c. Unit vectors parallel to $a = \pm a/|a|$
   d. A vector having magnitude m units and parallel to $a = \pm ma/|a|$
   e. The number of unit vectors is infinite.

5. Equal vectors: Two vectors **a** and **b** are equal if
   1. They have the same magnitude ($|a|=|b|$)
   2. They are in the same direction.

6. Position vector: Let o be a fixed point (called the origin) and let p be any point. If **OP**=**r** then r is called the position vector of P with respect to O.

7. Let **a** and **b** be the position vectors of the points A and B respectively then AB=position vector of B-position vector of Ai.e **AB**=**b-a.**

8. Coinitial Vectors: Vectors having the same initial point are called coinitial vectors. OA, OB,OC,… are coinitial vectos.

9. Vector Addition: Let **OA**=**a**,**AB=b** be two vectors. Then their sum **OA+AB** is defined as the vector **OB,OA+OB=OB** i.e. **a+b=c. AB+BC=AC.**
   a. Addition of vectors is commutative i.e **a+b=b+a.**
   b. Addition of vectors is associative i.e **(a+b)+c=a+(b+c).**
   c. Identity vector.

10. Free vector: A vector which is independent of its (initial point) position is called a free vector.

11. Localized vector: If a vector is associated with a given point in space, then it is called a localized vector.

12. Let **a,b** be the position vectors of the points **A** and **B** respectively. If the point P divides the line joining **A** and **B** in the ratio m: n then the position vector of P is (na+mb)/(m+n). The position vector of the midpoint of **AB=(a+b**)/2

13. Linear combination: Let $a_1,a_2,\ldots a_n$ be n vectors and let **r** be any vector. Then $\mathbf{r}=x_1\mathbf{a}_1+x_2\mathbf{a}_2+\ldots+x_n\mathbf{a}_n$ is called a linear combination of the vectors $a_1,a_2,\ldots a_n$.

14. Collinear vectors: Vectors which lie on a line or which are parallel are called collinear vectors (whatever be their magnitudes and directions).

15. Collinearity of three points: Let **A(a),B(b),C(c)** be three points. A necessary and sufficient condition for these points to be collinear is that there exist three scalars x,y,z not all zero such that
1)**xa+yb+zc**=0 and 2)x+y+z=0

16. The points A(**a**), B(**b**), C(**c**) are collinear if and only if **AB**=m**AC** or **AC**=n**AB**, where and n are scalars.

17. **Coplanar vectors**: Vectors which lie on a plane or which are parallel to a plane are called coplanar vectors. The vectors **a,b,c** are coplanar if
1) **xa+yb+zc**=0 and 2)The scalars x,y,z are not all zero.

18. A necessary and sufficient condition for four points **A(a),B(b),C(c),D(d)** to be coplanar is that there exist four scalars x,y,z, t not all zero such that
1)**xa+yb+zc+td=0** and 2)x+y+z+t=0

19. Unit orthogonal vectors: If **i,j,k** are three vectors such that
(1)|**i**|=|**j**|=|**k**|=1 and (2) (**i,j)=(j,k)**=(**k,i**) $=90^0$ then are called unit orthogonal vectors.

20. Equation to aline passing through the point A(**a**) and parallel to the vector **b** is **r=a+tb.**

21. Equation to a line passing through two points A(**a**) and B(**b**) is **r**=(1-t)**a**+t**b.**

22. The cartesian equation to a line passing through the point A $=(x_1,y_1,z_1)$ and parallel to the vector (a,b,c) is $[x-x_1]/a=[y-y_1]/b=[z-z_1]/c$.

23. The Cartesian equation to a line passing through two points A $=(x_1,y_1,z_1)$ and B$=(x_2,y_2,z_2)$ is$[x-x_1]/[x_1-x_2] = [y-y_1]/[y_1-y_2] = [z-z_1]/[z_1-z_2]$ or
$[x-x_2]/[x_1-x_2] =[y-y_2]/[y_1-y_2] = [z-z_2]/[z_1-z_2]$

24. The Cartesian equation to a line passing through the origin (0,0,0) and the point (x_1,y_1,z_1) is $x/x_1=y/y_1=z/z_1$.

25. The vector equation to the X→ axis is **r**= λ**i.**

26. The Cartesian equation to the X→ axis is x/1=y/0=z/0
Equation to a plane passing through point A(**a**) and parallel to the vectors **b** and **c** is **r** =**a**=t**b**+s**c.**

27. Equation to a plane passing through the points A(**a**) and B(**b**) and parallel to **c** is **r**=(1-t)**a**+t**b**+s**c.**

28. Equation to a plane passing through three points A(**a**), B(**b**) and C(**c**) is **r**=(1-t-s)**a**+t**b**+s**c.**

29. Equation to a plane passing through the origin (**0**) and parallel to the vectors **b** and **c** is **r**=t**b**+s**c**

30. The Cartesian equation to a plane passing through a point A(**a**) and parallel to the vectors **b** and **c** is [**r b c**]=[**a b c**] or [**r-a b c**]=0.

31. The Cartesian equation to a plane passing through two points A(**a**),B(**b**) and parallel to the vector **c** is [**r-a b-a c**]=0

32. The cartesian equation to a plane passing through three points A(**a**) ,B(**b**) and C(**c**) is [**r-a b-a c-a**]=0.

33. The Cartesian equation to a plane passing through the origin (**0**) and parallel to the vectors **b** and **c** is [**r b c**]=0

34. The condition for the lines **r=a**+t**b** and **r=c**+s**d** to be coplanar is
[**a b d] = [c b d] or [a-c d b**] = 0

35. Equation to the plane containing the lines **r=a**+t**b** and **r=c**+s**d**
1) [**r b d] = [a b d**] or [**r-a b d**]= 0
2)[**r b d**] = [**c b d**] or [**r-c b d**]=0.

36. Linearly dependent and independent vectors: A system of vectors $a_1,a_2,\ldots a_n$ is linearly dependent if there exist a system of scalars $x_1,x_2,\ldots x_n$ not all zero such that $x_1a_1+x_2a_2+\ldots x_na_n=0$.

The system of vectors $a_1,a_2\ldots a_n$ is linearly independent if every relation of the form

$$x_1a_1+x_2a_2+\ldots x_na_n=0 \text{ implies } x_1=x_2=\ldots x_n=0.$$

Exercise-A

1. The points -6a + 3b + 2c,3a – 2b+4c,5a + 7b + 3c, -13a +17b –c are
1) Collinear 2) coplanar but not collinear 3) non coplanar 4) none

2. If the position vectors of A,B are 2i + 3j + k and 3i – j +4k respectively then the position vector of the point which divides AB in the ratio 3:2 is

1)9i+30j+4k/5 2)8i+7k+3k/5 3)13i+3j+14k/5 4)12i+3j+5k/5

3. The vector equation of the plane passing through the point (1,2,3) and parallel to the vectors (-2,3,1), (2,-3,4) is
1) r=s(2i+j-k) + t(i+2j+2k) 2)r=2i+2j-3k+s(3i+3j-5k)+ (i+2j+k)`
3) r=(i+2j+3k) +s(-2i+3j+k) + t(2i-3j+4k) 4) none

4. If the position vectors of A,B,C are (-2,1,1),(-4,2,2),(6,-3,-3) and AB= λ AC then λ =
1)1 2)-2 3)4 4)-1/4

5. If a=3i+2j+k,b=6i+mj+nk and a ,b are collinear, then m, n are
1) m=2,n=10 2)m=10,n=2 3)m=4,n=2 4)m=2,n=4

6. Let a, b and c be three nonzero vectors, no two of which are collinear. If the vector a+2 is collinear with c, and b+3c is collinear with a, then a+2b+6c =
1) λ a 2) λ b 3) λ c 4)0

7. If the position vectors of A and B are 3i-2j+k and 2i+4j-3k then |AB|=
1) √14 2) √29 3) √ 43 4) √53

8. If a=3i-2j+k,b=2i-4j-3k,c= -i+2j+2k then a + b + c =
1)3i-4j 2)3i+4j3)4i-4j 4)4i+4j

9. The unit vector in the direction of i-2j+2k is
1) i-2j+2k/3 2)6i+2j-3k/3 3)i-2j+2k/7 4)6i+2j-3k/7

10. The unit vector parallel to the vector i + j- k is
1) ±(i +j-k)/√3 2)±(i –j + k)/√3 3)±(i +j+ k)/√3 4)±(i-j-k)/√3

11. If λ(2i-4j+4k) is a unit vector then λ=
1) ±1/6 2)1/6 3)6 4)16

12. If 2i+3j-6k, 6i-2j+3k,3i-6j-2k represent the sides of a triangle then the perimeter of the triangle is
1)14 2)21 3)7 4)6

13. The vectors AB=3i+4k and AC=5i-2j+4k are the sides of a triangle ABC. The length of the median through A is
1) √18 2) √72 3) √33 4) √288

14. If G is centroid of Δ ABC then GA+GB+GC=
1)0 2) OG 3)2 OG 4)3 OG

15. The vector equation of the line passing through (1,2,-1) and parallel to the vector (2,-1,3) is

1) r =2i-j+3k + t(i+2j-k) 2) r=(i+2j-k) + t(i-3j+4k)
3) r=(3i+j+2k) + t(2i-j+3k) 4) r=(i+j+k) + t(i-j+k)

16. The equation of the line passing through (2,3,1) and parallel to the vector (1,-2, 2) is
1) x-1/2=y+2/3=z-2/1 2) x-2/1=y-3/5=z-1/-1
3) x-1/1=y-5/-2=z+1/2 4) x-2/1=y-3/5=z-1/-2

17. If S is circumcentre and 'O' is orthocenter of ΔABC, then

List-I	List-II
A) $\overline{SA}+\overline{SB}+\overline{SC}$	1) 1/2 $\overline{OS}$
B) $\overline{OA}+\overline{OB}+\overline{OC}$	2) $2\overline{OS}$
C) $\overline{AO}+\overline{OB}+\overline{OC}$	3) $2\overline{AS}$
D) $\overline{OG}$	4) 2/3 $\overline{OS}$
	5) $\overline{SO}$

then correct matching

	A	B	C	D		A	B	C	D
1)	1	5	3	4	2)	5	2	4	3
3)	5	2	3	4	4)	2	4	3	5

A: The points wit position vector 60i +3j, 40i-8j, ai-52j are collinear then a=-40
R: Two vectors a,b are collinear then a=tb(t≠0); then the correct answer is
1)A,R are correct, R is correct explanation of A
2)A,R are correct, R is not correct explanation of A
3)A is correct, R is false
4)A is false, R is correct.

18. The length of the vector joining the points 7j +10k and –4i +9j +6k is
1)6 2) √6 3)7 4) √7

19. The length of the vector joining the points 2i +3j +k and i+j+k is
1)2 2) √3 3) √5 4) √7

20. a = i-j +k and b = 2i +j-k, then $|2\mathbf{a}-\mathbf{b}|$
1)6 2) √2 3)3√2 4)18

21. a = i-j +k and b = 2i +3j + k and c = I - k , then magnitude of a + 2b –3c is
1)87 2) $\sqrt{78}$ 3) $\sqrt{89}$ 4) $\sqrt{101}$

22. a = i +j - 2k and b = -i +2j + k and c = i-2j+2k, then the unit vector parallel to a + b + c is

1) $\frac{i+j+k}{\sqrt{3}}$ 2) - $\frac{i+j+k}{\sqrt{3}}$ 3) $\pm\frac{i+j+k}{\sqrt{3}}$ 4) $\frac{i+j-k}{\sqrt{3}}$

23. Unit vector parallel to sum of the vectors 2i +3j +4k and –2i +j – k is

1) $\pm\frac{i+4j+3k}{\sqrt{26}}$ 2) $\pm\frac{4j+3k}{\sqrt{25}}$ 3) $\pm\frac{i+3k}{\sqrt{10}}$ 4) $\pm\frac{i-j+k}{\sqrt{3}}$

24. If a,b,c ae linearly independent then the vectors a +b,b+c,a-c are

1)linearly independent 2)linearly dependent
3)non-coplanar 4)coplanar

25. Find the vector equation of a line passing through the point (2,31) and parallel to the vector (4-2,3)

1)r = (2i+3j+k) + t(4i-2j+3k) 2) r = (4i-2j+3k) +t(2i +3j+3k)
3) r = (2i+3j+k)+ t(2i-5j+2k) 4) r = (2i+3j+k) -t(4i-2j+3k)

26. Find the cartesian equation of the line passing through the point (4,2,1) and parallel to (3,-2,4)

1) $\frac{x-4}{3}=\frac{y-2}{-2}=\frac{z-1}{4}$ 2) $\frac{x-4}{3}=\frac{y-2}{2}=\frac{z-1}{4}$
3) $\frac{x-4}{3}=\frac{y-2}{-4}=\frac{z-1}{3}$ 4) $\frac{x-4}{3}=\frac{y-2}{-2}=\frac{z-1}{-4}$

27. The vector equation of the plane passing through the origin and the points 4j & 2i+ k

1) r = s(4j) + t(2i+k) 2) r = s(-2i-k) + t(4j)
3) r = s(4i) + t(2j+k) 4) r = s(4j) - t(2i+k)

28. The vector equation of the line passing through the points 3i-2j+k, 3i+4j+2k is

1) (3-3t)i –(2 +4t)j +(1+2t)k 2) (3-3t)i –(2 +4t)j +(1-2t)k
3) (3 + 3t)i +(2 +4t)j +(1-2t)k 4) (3-3t)i –(2 +4t)j - (1+2t)k

29. Cartesian equation of the plane passing through (0,0,0),(a,0,0),,(0,0,c) is

1)x = 0 2)z =0 3)y =0 4)x = 1

30. The point of intersection of the lines r = a + s(b+c), r =b+ t(c +a) is

1)a +b +c 2) a -b -c 3) b –c -a 4) b +c -a

PREVIOUS EAMCET PAPERS PROBLEMS

31. a, b, represent AB,BC respectively of a regular hexagon ABCDEF then CD,DE,EF,FA are (1989)

1) b- a, -a,-b, a-b 2) a- b, a, b, b-a 3) b- a, a, b, a-b 4)a-b,-a,-b, b-a

32. a and b are unit vectors along OA,OB and OC bisects the angle AOB. The unit vector along OC is (1990)
1)a+b/2 2)a-b/2 3) a+ b/ |a+ b| 4)a-b/|a-b|

33. The ratio in which i+2j+3k divides the join of -2i+3j+5k and 7i-k is
1)-3:2 2)1:2 3)2:3 4)-4:3 [1997][2007]

34. The three points whose position vectors are i+2j+3k,3i+4j+7k and - 3i-2j-5k [1998]
1) From the vertices of an equilateral triangle
2) From the vertices of a right angled triangle
3) are collinear
4) Form the vertices of an isosceles triangle

35. a=3i-2j+k and b=i+2j+5k, then the unit vector along a-b is (1999)
1) √2i+4j+4k/√34 2) i-2j-2k/3
3)-2i+4j+4k/6 4) √2i+4j-4k/√340

36. If a=3i-2j+k,b= -i+ j+ k then the unit vector parallel to the vector a+ b is (1999)
1)2/3i-1/3j+2/3k 2)2/5i-1/5j+2/5k
3)2/ √3i-1/ √3j+2./3k 4)-2/√ 3i+1/ √3j-2/ √3k

37. If OACB is a parallelogram with OC=a and AB=b then OA= (2000)
1) a+ b 2) a-b 3)1/2(b-a) 4)1/2(a-b)

38. ABCD is a parallelogram with AC, BD as diagonals. Then AC-BD= (2001)
1)4AB 2)3AB 3)2AB 4) AB

39. If a=i+4j,b=2i-3j and c=5i+9j then c = (2001)
1)2a+b 2)a+2b 3)a+3b 4)3a+b

40. If three points A,B and C have position vectors (1,x,3), (3,4,7) and (y,-2,-5) Respectively and if they are collinear, then (x, y) = (2002)
1) (2,-3) 2)(-2,3) 3) (-2,-3) 4)(2,3)

41. If a, b, c are three non collinear points then r =(1-p-q)a + p b +q c represents (2003)
1) line 2)plane3)plane passing through origin 4)sphere

42. If i+j+3k, 3i+2j+k are sides of a parallelogram, then a unit vector parallel to one of the diagonals of the parallelogram is (2004)
1) i+j+k/√3 2)i-j+k/√3 3)i+j-k/√3 4)-i+j+k/√3

43. If the vectors a=2i+3j+6k and b are collinear and |b|=21,then b= (2005)
1)±(2i+3j+6k) 2)±3(2i+3j+6k) 3) (i+j+k) 4)±21(2i+3j+6k)

44. I: Two non-zero, non-collinear vectors are linearly independent.

II: Any three coplanar vectors are linearly dependent. (2005)
Which of the above statements is true?
1) only I 2)onlyII 3)Both I and II4)Neither I nor II

45. Observe the following statements:
A: Three vectors are coplanar if one of them is expressible as a linear combination of the other two.
R: Any three coplanar vectors are linearly dependent.
Then which of the following is true? (2005)
1)Both A and R are true and R is the correct explanation of A
2)Both A and R are true but R is not correct explanation of A
3)A is true, but R is false
4)A is false, but R is true

46. The position vector of a point lying on the line joining the points whose position vectors are i+j-k and I-j+k is [2006]
1)j 2)i 3)k 4)0

48. If the points whose position vectors are 2i+j+k, 6i –j+2k and 14i-5j+pk are collinear, then the value of *p* is [2007]
1) 2 2) 4 3) 6 4) 8

49. The position vectors of P and Q are respectively a and b. If R is the point on $\vec{PQ}$ such that $\vec{PR} = 5 \quad \vec{PQ}$ then the position vector of R is [2008]
1)5b-4a 1)5b+4a 1)4b-5a 1)4b+5a

50. If the points whose position vectors are 60i+3j, 40i –8j and ai-52j are collinear, then a= [2008]
1)-40 2) -20 3) 20 4) 40

51. If the position vectors of A,B and C are respectively 2i-j+k,i-3j-5k and 3i-4j-4k then $\cos^2 A =$ [2008]
1)0 2)6/41 3)35/41 4)1

52. If $\vec{a} = -\vec{i} + \vec{j} + 2\vec{k}, \vec{b} = 2\vec{i} - \vec{j} - \vec{k}$ and $\vec{c} = -2\vec{i} + \vec{j} + 3\vec{k}$, then the angle between $2\vec{a} - \vec{c}$ and $\vec{a} + \vec{b}$ is : [2009]
1) $\frac{\pi}{4}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{2}$ 4) $\frac{3\pi}{2}$

53. If m_1, m_2, m_3 and m_4 are respectively the magnitudes of the vectors $\vec{a_1} = 2\vec{i} - \vec{j} + \vec{k}$, $\vec{a_2} = 3\vec{i} - 4\vec{j} - 4\vec{k}$, $\vec{a_3} = \vec{i} + \vec{j} - \vec{k}$, and $\vec{a_4} = -\vec{i} + 3\vec{j} + \vec{k}$, Then the correct order of m, m_2, m_3, m_4 is: [2009]
1) $m_3 < m_1 < m_4 < m_2$ 2) $m_3 < m_1 < m_2 < m_4$

3) $m_3 < m_4 < m_1 < m_2$ 4) $m_3 < m_4 < m_2 < m_1$

54. Let $\vec{a} = \vec{i} - 2\vec{j} + 3\vec{k}$, $\vec{b} = 2\vec{i} + 3\vec{j} - \vec{k}$, $\vec{c} = \lambda\vec{i} + \vec{j} + (2\lambda - 1)\vec{k}$.. If $\vec{c}$ is parallel to the plane containing $\vec{a}$, $\vec{b}$ then $\lambda =$ [2010]
1) 0 2) 1 3) -1 4) 2

55. If three unit vectors $\vec{a}, \vec{b}, \vec{c}$ satisfy $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ then the angle between $\vec{a} + \vec{b}$ is : [2010]
1) $\frac{2\pi}{3}$ 2) $\frac{5\pi}{6}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{6}$

56. The point of intersection of the lines $l_1 : \bar{r}(t) = \left(\bar{i} - 6\bar{j} + 2\bar{k}\right) + t\left(\bar{i} + 2\bar{j} + \bar{k}\right)$ $l_2 : \bar{R}(u) = \left(4\bar{j} + \bar{k}\right) + u\left(2\bar{i} + \bar{j} + 2\bar{k}\right)$ is [2012]
1) (4, 4, 5) 2) (6, 4, 7) 3) (8, 8, 9) 4) (10, 12, 11)

57. If the points A(a), B(b), C(c) satisfy the relation 3a-8b+5c=0 then the points are
1) Vertices of an equilateral triangle 2) Collinear
3) Vertices of a right angled triangle
4) Vertices of a isosceles triangle

58) The poimts whose position vectors are $2\vec{i} + 3\vec{j} + 4\vec{k}$, $3\vec{i} + 4\vec{j} + 2\vec{k}$ & $4\vec{i} + 2\vec{j} + 3\vec{k}$ are the vertices of [2013]
1) An isosceles triangle 2) Right angled triangle
3) Equilateral triangle 4) Right angled isosceles triangle

59. Three non-zero non-collinear vectors $\bar{a}, \bar{b}, \bar{c}$ are such that $\bar{a} + 3\bar{b}$ is collinear with $\bar{c}$ while $3\bar{b} + 2\bar{c}$ is collinear with $\bar{a}$ Then $3\bar{a} + 2\bar{c} =$ (2014)
1) $2\bar{a}$ 2) $3\bar{b}$ 3) $4\bar{c}$ 4) $\bar{0}$

60. If $\bar{a}, \bar{b}$ & $\bar{c}$ are non-coplanar vectors & if $\bar{d} = \frac{1}{x}\left(\bar{a} + \bar{b} + \bar{c}\right)$ & $\bar{d} = \frac{1}{y}\left(\bar{b} + \bar{c} + \bar{d}\right)$ where x & y are non-zero real numbers, then $\frac{1}{xy}\left(\bar{a} + \bar{b} + \bar{c} + \bar{d}\right) =$ (2014)
1) $\overline{-a}$ 2) $\bar{0}$ 3) $2\bar{a}$ 4) $3\bar{c}$

61. P is the point of intersection of the diagonals of the parallogram ABCD. If λ is any point in the space & $\overline{SA} + \overline{SB} + \overline{SC} + \overline{SD} = \lambda\overline{SP}$, then $\lambda =$ (2015)
1) 2 2) 4 3) 6 4) 8

62. If M & N are the mid points of the side BC & CD respectively of a parallogram ABCD, then $\overline{AM} + \overline{AN} =$ (2015)
1) $\frac{4}{3}\overline{AC}$ 2) $\frac{5}{3}\overline{AC}$ 3) $\frac{3}{2}\overline{AC}$ 4) $\frac{6}{5}\overline{AC}$

63. ABCD is a parallogram & P is a point on the segment $\overline{AD}$ dividing it internally in the ratio 3:1. The line $\overline{BP}$ meets the diagonals AC in Q. Then AQ : QC = (2015)

1) 3 : 4 2) 4 : 3 3) 3 : 2 4) 2 : 3

64. If m_1, m_2, m_3, m_4 are respectively the magnitudes of the vectors $\overline{a_1} = 2i - j + k$, $\overline{a_2} = 3i - 4j - 4k$, $\overline{a_3} = -i + j - k$, $\overline{a_4} = -i + 3j + k$ then the correct order of m_1, m_2, m_3, m_4 is (2015 A.P.)

1) $m_3 < m_1 < m_4 < m_2$ 2) $m_3 < m_1 < m_2 < m_4$
3) $m_3 < m_4 < m_1 < m_2$ 4) $m_3 < m_4 < m_2 < m_1$

65. If $\overline{a}, \overline{b}, \overline{c}$ are unit vectors such that $\overline{a} + \overline{b} + \overline{c} = \overline{0}$, then $\overline{a}.\overline{b} + \overline{b}.\overline{c} + \overline{c}.\overline{a} =$ (2015 A.P.)

1) $\frac{3}{2}$ 2) $-\frac{3}{2}$ 3) $\frac{1}{2}$ 4) $-\frac{1}{2}$

66. ABCDEF is a regular hexagon whose centre is O. Then $\overrightarrow{AB} + \overrightarrow{AC} + \overrightarrow{AD} + \overrightarrow{AE} + \overrightarrow{AF}$ is (2016)

1) $2\overrightarrow{AO}$ 2) $3\overrightarrow{AO}$ 3) $5\overrightarrow{AO}$ 4) $6\overrightarrow{AO}$

67. ABCD is a parallelogram & P is the midpoint of the side AD. The line BP meets the diagonal AC in Q. Then the ratio AQ : QC = (2016)

1) 1 : 2 2) 2 : 1 3) 1 : 3 4) 3 : 1

68. The Cartesian equation of the plane whose vector equation is $\overline{\gamma} = (1 + \lambda - \mu)\overline{i} + (2 - \lambda)\overline{j} + (3 - 2\lambda + 2\mu)\overline{k}$, where λ, μ are scalars is (2016AP)

1) 2x + y = 5 2) 2x – y = 5 3) 2x – z = 5 4) 2x + z = 5

69. For three vectors o, q & r if r = 3p + 4q & 2r = p – 3q, then (2016AP)

1) |r| < 2|q| & r, q have the same direction
2) |r| > 2|q| & r, q have opposite directions
3) |r| < 2|q| & r, q have opposite directions
4) |r| > 2|q| & r, q have same direction

70. If a = 2i + 3j – 5k, b = mi + nj + 12k, & a x b = 0, then (m, n) = (2016AP)

1) $\left(\frac{-24}{5}, \frac{-36}{5}\right)$ 2) $\left(\frac{-24}{5}, \frac{36}{5}\right)$ 3) $\left(\frac{24}{5}, \frac{-36}{5}\right)$ 4) $\left(\frac{24}{5}, \frac{36}{5}\right)$

71. If the vectors a = i + j + k, b = i – j + 2k & c = xi + (x – 2)j – k are coplanar, then x = (2017)

1) 1 2) 2 3) 0 4) -2

72. If the magnitude of a . b & a + b are respectively 3, 4 & 5, then the magnitude of (a – b) is (2017)
1) 3 2) 4 3) 6 4) 5

73. The points with position vectors a + b, a – b & a + kb are collinear (2017AP)
1) For exactly two values of k 2) For exactly three values of k
3) For no real value of k 4) For all real values of k

74. If A(4, 7, 8), B(2, 3, 4) & C(2, 5, 7) are the position vectors of the vertices of a triangle ABC & if the internal bisector of $\angle A$ meets BC & D at AD = (2017AP)
1) $\frac{3}{2}\sqrt{34}$ 2) $\frac{2}{3}\sqrt{34}$ 3) $\frac{1}{2}\sqrt{34}$ 4) $\frac{1}{6}\sqrt{34}$

KEY

1) 2	2) 3	3) 3	4) 4	5) 3	6) 4	7) 4	8) 3	9) 1	10) 1
11) 1	12) 2	13) 3	14) 1	15) 3	16) 3	17) 3	18) 1	19) 1	20) 3
21) 3	22) 2	23) 3	24) 2	25) 2	26) 1	27) 1	28) 1	29) 2	30) 3
31) 1	32) 1	33) 3	34) 2	35) 3	36) 2	37) 4	38) 3	39) 4	40) 4
41) 3	42) 3	43) 1	44) 2	45) 3	46) 3	47) 2	48) 2	49) 1	50) 1
51) 3	52) 2	53) 1	54) 1	55) 1	56) 3	57) 2	58) 3	59) 4	60) 2
61) 2	62) 3	63) 1	64) 1	65) 2	66) 4	67) 1	68) 4	69) 2	70) 1
71) 2	72) 4	73) 4	74) 2	75)	76)	77)	78)	79)	80)

AIEEE PROBLEMS

1. The values of *a*, for which the points *A*, *B*, *C* with position vectors $2i–j–k$, $i–3j–5k$ and $ai –3j+k$ respectively are the vertices of a right angled triangle with C = π/2 are [2006]
1) –2 and 1 2) 2 and –1 3) 2 and 1 4) –2 and –1

2. If a, b, c are three vectors such that a+b+c = 0, |a| = 1, |b| = 2, |c| = 3 then a·b+b·c+c·a = [2002]
1) 0 2) –7 3) 7 4) 1

3. Let u, v, w be such that |u| = 1, |v| = 2, |w| = 3. If the projection v along u is equal to that of w along u and v, w are perpendicular to each other then | u – v + w | = [2004]
1) 2 2) 14 3) √14 4) √7

4. The distance between the line r = 2i – 2j + 3k + λ(i–j+4k) and the plane r·(i+5j+k) = 5 is [2005]

1) $\frac{10}{9}$ 2) $\frac{10}{3\sqrt{3}}$ 3) $\frac{3}{10}$ 4) $\frac{10}{3}$

5. A particle acted on by constant forces 4i+j–3k and 3i+j–k is displaced from the point i+2j+3k to the point 5i+4j+k. The total work done by the forces is [2004]
1) 20 unit 2) 30 unit 3) 40 unit 4) 50 unit

KEY

1) 3 2) 2 3) 3 4) 2 5) 3

5. MULTIPLICATION OF VECTORS

1. Let **a** and **b** are two non zero vectors and θ be the angle between them then the scalar product or dot product of **a** and **b** is denoted by **a.b** and is defined as **a.b** =|**a**||**b**|cosθ.

2. If (**a,b**)=θ then $\cos\theta = \dfrac{\mathbf{a.b}}{|\mathbf{a}||\mathbf{b}|}$

3. Let (**a,b**)= θ, Then $\theta < 90^0 \Leftrightarrow$ **a.b** > 0

   $\theta > 90^0 \Leftrightarrow$ **a.b** < 0

   $\theta = 90^0 \Leftrightarrow$ **a.b** = 0

4. If **a** and **b** are parallel and are in the same direction (**a,b** are like vectors) then **a.b=|a||b|.**

5. If **a** and **b** are parallel and are in opposite direction (**a, b** are unlike vectors) then **a.b=- |a||b|.**

6. If **a,b** be two unit vectors then **a.b**=Cosθ

7. The perpendicular distance from a point $\vec{a}$ to the line through $\vec{b}$ and parallel to $\vec{c}$ is $\dfrac{\left|(\vec{b}-\vec{a})\mathrm{X}\,\vec{c}\right|}{\left|\vec{c}\right|}$.

   If **a,b** be two non-zero vectors then

8. The orthogonal projection (Vector component) of **b** on **a**= $\dfrac{(\mathbf{a.b})\mathbf{a}}{|\mathbf{a}|^2}$

9. The orthogonal projection (Vector component) of **a** on **b**= $\dfrac{(\mathbf{a.b})\mathbf{b}}{|\mathrm{b}|^2}$

10. The orthogonal projection of **b** in the direction perpendicular to that of

    $$\mathbf{a}= b-\frac{(a.b)a}{|a|^2} = \frac{a\ X(b\ X\ a)}{|a|^2}$$

11. The length of the orthogonal projection of **b** on **a** = | **(a.b)/ a** |

12. The length of the orthogonal projection of **a** on **b**=| **(a.b)/ b** |

13. The scalar product is commutative i.e. **a.b=b.a**

14. The scalar product is distributive over vector addition i.e, **a.(b+c)=a.b+a.c,(b+c).a=b.a+c.a**

15. **a=a_1i+a_2j+a_3k and b=b_1i+b_2j+b_3k** then
    1. **a.b=**$a_1b_1 + a_2b_2 + a_3b_3$
    2. **a.a=a_1^2+a_2^2+a_3^2**
    3. **|a|^2=a_1^2+a_2^2+a_3^2**
    4. **a.a=|a|^2 or |a|=√(a.a)**

16. **(a+b)^2= |a+b|^2 = |a|^2 +|b|^2 + 2a.b**

17. **|a-b|^2=(a-b)^2=|a|^2+|b|^2-2a.b**

18. **|a+b|^2+|a-b|^2=2{|a|^2+|b|^2}**

19. |a+**b|^2-|a-b|^2=4(a.b)**

20. **(a+b+c)^2=|a+b+c|^2=|a|^2+|b|^2+|c|^2 +2 (a.b+b.c+c.a)**

21. Let **i,j,k** be unit orthogonal vectors ,then
    i.i=j.j=k.k=1 and **i.j=j.k=k.j**=0 and **j.i=k.j=i.k**=0

22. Let l_1,m_1,n_1 be the direction cosines of **a** and let l_2,m_2,n_2 be the direction cosines of **b** and let (**a, b**)=θ, then cosθ=l_1l_2+m_1m_2+n_1n_2.

23. Let **a,b** be two non zero vectors and let θ be the angle between them then vector product (cross product) of **a** and **b** is denoted be **a x b** and is defined as **axb**=|**a**||**b**| sinθ**n** where

    $\hat{n}$ is a unit vector perpendicular to both **a** and **b.**

24. sinθ=|**axb**|/|**a**||**b**|

25. Two vectors **a** and **b** are parallel if and only if **axb=0**

26. Let **i,j,k** be unit orthogonal vectors then
    i) **ixi=jxj=kxk**=0
    ii) **ixj=k, jxk=i, kxi=j**
    iii) **jxi=-k, kxj=-i, ixk=-j**

27. If $\mathbf{a}=a_1\mathbf{i}+a_2\mathbf{j}+a_3\mathbf{k}$ and $\mathbf{b}=b_1\mathbf{i}+b_2\mathbf{j}+b_3\mathbf{k}$

$$\text{then axb} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix}$$

axb=-(**bxa**) i.e. vector product is not commutative and **axa**=0.

28. Let **a,b** be two non-zero vectors then
    a. **axb** is a vector perpendicular to both **a** and **b** (perpendicular to the plane containing **a** and **b**)
    b. Unit vectors perpendicular to **a** and **b** are $\pm \dfrac{\mathbf{axb}}{|\mathbf{axb}|}$
    c. Vector area of the parallelogram with sides **a** and **b** is |**axb**| sq.units
    d. Vector area of the parallelogram with diagonals **a** and **b** $=\frac{1}{2}|a\times b|$ sq.units**.**
    e. Vector area of the triangle with sides **a** and **b** is $\frac{1}{2}|a\times b|$ sq.units**.**
    f. Area of the triangle with vertices A(**a**), B(**b**),C(**c**) is Δ=½ |**AB x AC**|= 1/2 |**axb + bxc + cxa** |**.**

29. Let **a,b,c** be three non-zero vectors then **a.(bxc)**=[**a b c**] denotes the volume of the parallelepiped with sides **a,b,c.**

30. Let **a,b,c** be three non-zero vectors
    1. [**a b c**]=0⇔ **a,b,c** are linearly dependent vectors
    2. [**a b c**]>0⇔**a,b,c** is a right handed system
    3. [**a b c**]<0⇔ **a,b,c** is a left handed system

31. In a triple scalar product the "dot" and the "cross" can be interchanged:
    a.(bxc)=(axb).c

32. The value of [**a b c**]=0 if
    (1)one of the vectors is zero or (2) two vectors are equal or(3) two vectors are collinear or(4)one vector is a linear combination of the remaining two vectors. (5)**a,b,c** are coplanar.

33. Let **a,b,c** be three non-zero vectors then the products of the form **ax(bxc)**,(**axb)xc** etc. are called vector triple products.
    a. **ax(bxc)=(a.c)b – (a.b)c**
    b. **(axb)xc=(c.a)b –(c.b)a**

34. Let **a,b,c,d** be four non-zero vectors then the products of the form **(axb).(cxd),(axc).(bxd),** etc., are called scalar products of four vectors.

$$\mathbf{(axb).(cxd)} = \begin{vmatrix} \mathbf{a.c} & \mathbf{a.d} \\ \mathbf{b.c} & \mathbf{b.d} \end{vmatrix}$$

35. Let **a,b,c,d** four nonzero vectors then the products of the form (**axb) x (cxd), (axc)x(bxd**) etc. are called vector products of four vectors.

1. **(axb) x(cxd_= [a b d]c –[a b c]d**
2. **(axb) x(cxd)=[c d a]b-[c d b]a**

36. The shortest distance between the lines **r**=**a**+t**b** and **r**=**c**+s**d** is |[**a-c b d]|/|bxd|.**

37. Let A=**a**,B=**b**, C=**c**, D=**d.** The shortest distance between the lines **AB, CD** is |[**AC AB CD]| / |AB XCD**|.

38. The volume of the parallelepiped with **a,b,c** are coterminous edges is [**a b c**] or (a x b).c

39. The volume of the parallelepiped with vertices A,B,C and D is [AB AC AD] cubic units.

40. The volume of the tetrahedron with A, B, C, D as coterminous edges is $\frac{1}{6}$[AB AC AD] cubic units.

41. [**a +b b+c c +a**] = 2[a b c]

42. [**a** X **b b** X **c c** X **a**] = 2[a b c]^2

43. Four points **a,b,c,d** are coplanar, then [**b c d] +[c a d**] +[a b d] =[**a b c**].

44. If **a, b, c** are unit vectors ⊥ to each other then [**a b c**]^2 = 1

45. The length of the ⊥ from the origin to the plane containing the points a, b, c is

$$\frac{\left|\left(\vec{a}\,\vec{b}\,\vec{c}\right)\right|}{\left|\left(\vec{b}\,\mathrm{X}\,\vec{c}\right)+\left(\vec{c}\,\mathrm{X}\,\vec{a}\right)+\left(\vec{a}\,\mathrm{X}\,\vec{b}\right)\right|}$$

46. The shortest distance between two non- intersecting lines given by

r = **a** ± t**b** and **r** = **c** +s**d** is $\frac{\left|\left(\vec{a}-\vec{c}\quad\vec{b}\quad\vec{d}\right)\right|}{\left|\vec{b}\,\mathrm{X}\,\vec{d}\right|}$

Exercise-A

1. If $|\mathbf{a+b}|=|\mathbf{a-b}|$ then $\mathbf{a.b}$=___
   1)0 2)8 3)16 4)10

2. [(a xb) x (a x c)].d=
   1)**(a.d)[a b c]** 2)**(b.d) [a b c]** 3)**(c.d) [a b c]** 4)0

3. {**a.(bx i)**}**i**+{**a.(b x j)**} **j**+{**a.(b x k)**}**k=**
   1)2(a x b) 2)3(a x b) 3)(a x b) 4)a

4. If the vectors **2i-3j+4k,i+2j-k and xi-j+2k** are coplanar then x=
   1)8/5 2)5/8 3)0 4)1

5. If **a,b,c** are three vectors such that **a+b+c**=0,|**a**|=1,|**b**|=2,|**c**|=3 then **a.b+b.c+c.a**=
   1)0 2)-7 3)7 4)1

6. If **a**=2**i**-3**j**-**k**,**b**=**i**+4**j**-2**k** then **a.b**=____
   1)0 2)-3 3)16 4)-8

7. If|**a**|=2,|**b**|=3,(**a,b**)=120^0 then **a.b**=____
   1)0 2)-3 3)16 4)-8

8. If **a**=2**i**-3**j**-**k**,**b**=**i**+4**j**-2**k** then **a**.**b**=
   1)0 2-3 3)16 4)-8

9. If **a**=3**i**+2**j**+4**k**, **b**= -**i**+2**j**+**k** then $\sqrt{\mathbf{a.b}}$=___
   1) $\sqrt{5}$ 2)- $\sqrt{5}$ 3) $\sqrt{13}$ 4)- $\sqrt{13}$

10. If $\vec{OA}$=**i**+2**j**+3**k**,$\vec{OB}$=3**i**+**j**-2**k**, $\vec{OC}$=2**i**-3**j**+**k** then $\vec{AB}.\vec{AC}$=____
    1)15 2)17 3)0 4)1

11. If **p**=(2,1,3), **q**=(-2,3,1),**r**=(3,-2,4) and **j** is the unit vector in the direction of y-axis, then (2**p**+3**q**-4**r**).**j**=___
    1)18 2)19 3)20 4)21

12. If **a**=(1,-7,2),**b**=(-2,3,5),**c**=(2,-2,4) and **i** is the unit vector in the x-direction, then (**a**-2**b**+3**c**).**i**=___
    1)11 2)15 3)18 4)36

13. The angle between the vectors 6**i**+2**j**+**k**,2**i**-9**j**+6**k** is
    1)90^0 2)60^0 3)45^0 4)30^0

14 The angle between the vectors **i**+2**j-k**,2**i+j**+**k** is
    1)90^0 2)60^0 3)45^0 4)30^0

15. If **a**=3**i**-4**j**+5**k**, **b**=2**i**+3**j**-**k**, then the angle between **a** and **b** is
1)π-$Cos^{-1}(11/10\sqrt{7})$ 2)$Cos^{-1}(11/10\sqrt{7})$
3)π+$Cos^{-1}(11/10\sqrt{7})$ 4) -$Cos^{-1}(11/10\sqrt{7})$

16. I: If a,b,c,d are four vectors then (axb).(cxd)= $\begin{vmatrix} a.c & a.d \\ b.c & b.d \end{vmatrix}$
II. If a,b,c are three vectors then (axb)xc=(c.a)b -(c.b)a
1)Only I is true 2)Only II is true
3)Both I& II are true 4)Neither I nor II

17. A: The vector equation of the plane passing through i+j+k and parallel to the vectors 2i+3j-k,i+2j+3k is [r-(i+j+k),2i+3j-k ,i+2j+3k]=0
R: The vector equation of the plane passing through the point a and parallel to the vectors b,c is [r-a b c]=0
1) A and R are true and R is correct explanation of A
2) A and R are true but R is not the explanation of A
3) A is true but R is false.
4) A is false but R is true.

18. If **a**=**i**+**j**+**k**, **b**=2**i**-3**j**+**k** then **axb** is
1)**4i+j-5k** 2)4**i**-3**j**+5**k** 3)4**i**+**j**+5**k** 4)4**i**-**j**-5**k**

19. If **a=**2**i-j+k, b=**3**i+**4**j-k** then |**axb**|=_____
1)9 2)3√10 3)**√155** 4)5√5

20. If |**a**|=2,|**b**|=4,(**a,b**)=π/6 then |**axb**| is
1)4 2) √3 3)15√3 4)6

21. If |**p**|=2, |**q**|=3 then (**p.q**)= π/6, then $|\mathbf{pxq}|^2$=___
1)7 2)9 3)8 4)12

22. $(\mathbf{a\ x\ b})^2$=___
1)**a.b** $-\mathbf{a^2b^2}$ 2)$\mathbf{a^2b^2}$**-a.b** 3)$(\mathbf{a.b})^2-\mathbf{a^2b^2}$ 4)$\mathbf{a^2b^2-(a.b)^2}$

23. A unit vector perpendicular to the plane determined by the pointsP(1,-1,2), Q(2,0,-1) and R(0,2,1) is
1)$\frac{2i+j+k}{\sqrt{6}}$ 2)$\frac{2i+j+k}{3}$ 3)$\frac{2i-j-k}{\sqrt{3}}$ 4)$\frac{2i-j-k}{3}$

24. A unit vector normal to the plane through the points **i**,2**j**,3**k** is
1)6**i**+3**j**+**2k** 2)**i**+2**j**+3**k** 3)$\frac{6i+3j+2k}{7}$ 4)$\frac{6i+3j+2k}{7}$

25. The unit vector orthogonal to **a**=2**i**+2**j**+**k**,**b**=3**i**+4**j**-12**k** and forming a right handed system with **a** and **b** is

1)**-28i**+27**j**-2**k** 2)-28**i**+27**j**+2k 3)$\frac{28\mathbf{i}-27\mathbf{j}-2\mathbf{k}}{\sqrt{1517}}$ 4)$\frac{-28\mathbf{i}+27\mathbf{j}+2\mathbf{k}}{\sqrt{1517}}$

26. If **a**=2**i**+**j**_3**k**,**b**=-**i**-2**j**+**k** then a vector of length 5 and perpendicular to both **a** and **b** is

1)$\frac{\pm 5(\mathbf{i}+\mathbf{j}+\mathbf{k})}{\sqrt{3}}$ 2)$\frac{\pm 5(\mathbf{i}+\mathbf{j}-)}{\sqrt{3}}$ 3)$\frac{\pm 5(\mathbf{i}-+\mathbf{k})}{\sqrt{3}}$ 4)$\frac{\pm 5(\mathbf{i}-\mathbf{j}-\mathbf{k})}{\sqrt{3}}$

27. If **a**=2**i**+**j**-3**k**, b=**i**-2**j**+**k** then the vector of length 2√3 and perpendicular to both **a** and **b** is

1)**i**+**j**+**k** 2)**i**-**j**-**k** 3)**2i+2j+2k** 4)2**i**-2**j**-2**k**

26. [**i j k**] +[**j k i**] + [**i k j**] =____

1)1 2)-1 3)2 4)0

29. $\frac{[\mathbf{a}\ \mathbf{b}\ \mathbf{c}]}{[\mathbf{b}\ \mathbf{a}\ \mathbf{c}]}$ =____

1)1 2)-1 3)2 4)3

30. [**i+j j+k k+i**]=_____

1)1 2)-1 3)2 4)-2

31. [**i-j j-k k**-i]=_____

1)0 2)1 3)-1 4)-2

32. If **a=i-j**-6k**,b=i**-3**j**+4**k,c**=2**i**-5**j**+3**k** then **[a b c**]=____

1)0 2)1 3)-1 4)2

33. If **a**=2**i**+2**j**+**k**,**b**=2**i-3j**+2**k,c**=13**i-7j+3k** then **[a b c**]=____

1)2 2)1 3)-1 4)0

34. **(**2**i**+2**j**+**k**).(**i**-**j**+2**k**) x (2**i**+**j**+**k**)=_____**

1)-12 2)14 3)10 4)15

35. If **a** is perpendicular to **b** and **c**,|**a**|=2,|**b**|=3,|**c**|=4 and the angle between **b** and **c** is 2π/3 then |[**a b c**]|=_____

1)24 2)12 3)12√3 4)24√3

36. If **a,b** and **c** are mutually perpendicular unit vectors, then $[\mathbf{a}\ \mathbf{b}\ \mathbf{c}]^2$=____

1)1 2)0 3)2 4)3

37. The volume of the parallelepiped with edges are **i, i+j,i+j+k** is

1)0 2)1 3)2 4)3

38. If **a**,**b**,**a**+**b** are unit vectors then (**a**,**b**)= (1987)
1)$\pi/6$ 2)$\pi/3$ 3)$\pi/2$ 4)$2\pi/3$

39. If **a**=**i**+2**j**+3**k**,**b**=--**i**+2**j**+**k**,**c**=3**i**+**j** and **a**+t**b** is perpendicular to **c** then t= (1988)
1)5 2)4 3)3 4)2

40. If **a** is any vector then $(\mathbf{a} \times \mathbf{i})^2+(\mathbf{a} \times \mathbf{j})^2+(\mathbf{a} \times \mathbf{k})^2=$ (1988)
1)$\mathbf{a}^2$ 2)$2a^2$ 3)$3\mathbf{a}^2$ 4)$4\mathbf{a}^2$

41. (A xB).{B xA) x(CxA)} (1989)
1)(**B+C).{C+A)x(A+B**)} 2){A.(BxC)}^{2} 3)**2A.(BxC)** 4)none

42. The volume of the tetrahedron formed by **4i+5j+k,-j+k, 3i+9j+4k, 4(-i+j+k**) is (1989)
1)7 2)9 3)11 4)13

43. If (**a**-λ**b**).(**b**-2**c**) x(**c**+3**a**)=0 then λ= (1990)
1)0 2)-3 3)6 4)-1/6

44. The area of the parallelogram whose adjacent sides are **3i+2j+k** and **3i+k** is (1990)
1) $\sqrt{10}$ 2)$10\sqrt{2}$ 3)$2\sqrt{10}$ 4)20

45. If **a** is a unit vector and **axi**=**j** then **a.i**= (1990)
1)0 2)1 3)2 4)3

46. The equation of the plane passing through the point with position vector **a** and perpendicular to **b** is (1990)
1)**r.**(**a** x **b**)=0 2)**r.**(**a** x **b**) 3)**r.(b** x **a**) 4)**(r-a).b=0**

47. **a x(b x c)=** (1991)
1)**(a.b)c-(a.c)b** 2)**(a.c)b-(a.b)c**
3)**(c.a)b-(c.b)**a 4)**(c.b)a-(c.a)b**

48. The area of the triangle whose sides are given by **2i-7j+k** and **4j-3k** is (1991)

1)17 2)17/2 3)17/4 4)$1/2\sqrt{389}$

49. The unit vector perpendicular to each of the vectors **2i-j+k** and **3i+4j-k** is (1991)
1)**-3i+5j+11k** 2)$\frac{\mathbf{-3i+5j+11k}}{\sqrt{\mathbf{155}}}$ 3)$\frac{\mathbf{-3i+5j+11k}}{155}$ 4)$\frac{\mathbf{3i-5j+11k}}{\sqrt{155}}$

50. The position vectors of three non collinear points A,B,C are **a,b,c** respectively.

The distance of the origin from the plane through A,B,C is If **ax i+2a-5j**=0 then **a**= (1992)
1)**2i+k** 2)**i+2k** 3)**2j+k** 4)**j+2k**

51. [**bxc cxa axb**]= (1993)
1)**[abc]** 2) 2[**abc**] 3)[**abc**]^2 4)0

52. If **a.i** =4 then (**a** x **j**).(2**j**-3**k**)= (1994)
1)12 2)2 3)0 4)-12

53. If (a x b)^2+(a.b)^2=144 and |a|=4 then |b|= (1994)
1)16 2)8 3)3 4)12

54. If **a,b,c** are the position vectors of the vertices of a triangle ABC, Then the area of ΔABC is
1)**[abc]** 2)1/2[**abc**] 3)|**axb+bxc+cxa**| 4)**1/2|axb+bxc+cxa|** (1994)

55. Match the following

I. The angle between the vectors 2i+j-k,i-4j-2k	a)π/6
II.The angle between the vectors i+2j-k,2i+j+k	b)π/4
III.The angle betweeen a,b if a,b,a+b are unit vectors	c)π/3
IV.The anglebetween AC,BD If A=(1,1,0), B=(1,-1,0),c=(-1,1,0),D=(0,-1,1)	d)π/2
	e)2π/3

1)a,c,e,b 2)d,c,e,b 3)c,a,b,d 4)d,e,c,a

56. A: The torque about the point **2i+j-k** of a force represented by **4i+k** acting through` the point **i-j+2k** is **-2i+13j+8k**
R: The torque of a force **F** about a point p is **r** x **F** where **r** is the vector from the point p to any point a on the line of action L of **F**
1) Both A and R are true and R is the correct explanation of A
2)Both A and R are true but R is not correct explanation of A
3)A is true but R is false
4)A is false but R is true

57. If the vectors **2i-j+k,i+mj, i+j+k** are coplanar then the value of m is (1995)
1)1 2)-1 3)-2 4)2

58. The equation to the plane containing the **ax{bx(cxa)+(pxq)}**= (1995)
1)**(a.q)p-(a.p)q+(b.a)(axc)-(bxc)** 2)**(a.q)p-(a.p)q+(b.a)(axc)**
3)**ax(pxq)+[abc]c** 4)none of these

59. lines **r=a+tb,r=b+sa** is (1995)
1)[r a b]=0 2)**r.a=a.b** 3)**r.a=r.b** 4)**r.b=a.b**

60. The orthogonal projection of **a**=2**i**+3**j**+3**k** on **b**=**i**- 2**j**+**k** is (1996)

1)$\frac{-\mathbf{i}+2\mathbf{j}-\mathbf{k}}{\mathbf{6}}$ 2)$\frac{-\mathbf{i}+2\mathbf{j}-\mathbf{k}}{\sqrt{6}}$ 3)**i**-2**j**+**k** 4)-**i**+2**j**-**k**

61. The unit vector normal to the plane containing **a=i-j-k** and **b=i+j+k** is (1996)
1)**j-k** 2)**k-j** 3)$\frac{\mathbf{k-j}}{\sqrt{\mathbf{2}}}$ 4)$\frac{\mathbf{k-j}}{\sqrt{2}}$

62. If the three vectors **2i-j+k,i+2j-3k** and 3**i**+λ**j**+5**k** are coplanar then λ= (1996)
1)4 2)-4 3)2 4)3

63. If **i +j +k i-j ,i+2j**+a**k** are coplanar then a is (1996)
1)3/2 2)3 3)-3 4)0

64. f the volume of the tetrahedron with edges **2i+j-k,i**+a**j+k** and **i+2j-k** is one cubic unit then a=
1)1 2)-1 3)2 4)-2 (1996)

65. For non zero vectors **a,b,c;|axb.c|=|a||b||c|** holds if and only if (1996)
1)a.b=b.c=c.a 2)**a.b+b.c+c.**a=0 3)**a+b+c**=0 4)[**abc**]=0

66. i x(axi)+jx(axj) +kx(axk)= (1996)
1)3**a** 2)2a 3)**a** 4)0

67. A unit vector perpendicular to **2i+3j+4k** and **4i-3j+2k** is (1997)

1)$\frac{3i+2j-3k}{\sqrt{22}}$ 2)$\frac{3i-2j-3k}{\sqrt{22}}$ 3)$\frac{3i-2j+3k}{\sqrt{22}}$ 4)none

68. If **a=2i+3j ,b=i+j+k,c**=λ**i**+4**k**+2**k** are the edges of a parallelepiped of volume 2 cubic units, then a value of λ is (1997)
1)1 2)2 3)3 4)4

69. If the vectors **a**=(1,x,-2),**b**=(x,3,-4) are mutually perpendicular, then x is (1998)
1)-2 2)2 3)4 4)-4

70. The angle between the planes **r.**(**2i-j+2k**)=3,and **r**.(**3i-6j+2k**)=4 (1998)
1)$\cos^{-1}(16/21)$ 2)$\sin^{-1}(4/21)$ 3)$\cos^{-1}(1/4)$ 4)$\cos^{-1}(3/4)$

71. If |a|=5,|b|=6,|a.b|=24 then |ax b|= (1998)

1)$\sqrt{224}$ 2)18 3) $\sqrt{300}$ 4) $\sqrt{254}$

72. If **A,B,C** are three vectors such that |**A**|=4, |**B**|=5,|**C**|=6 then [**A-B B-C C-A**]=
1)120 2)2 3)0 4)54 (1998)

73. If **a** and **b** are unit vectors and |**a x b**| =1, then the angle between **a** and **b** is (1999)
1)π/4 2)π/2 3)π/3 4)π

74. If **a** and **b** are unit vectors such that |**a x b**|=**a.b** then $|\mathbf{a}+\mathbf{b}|^2$= (1999)
1)2 2)2+√2 3)2-√2 4) √2

75. If θ is an acute angle and the vector and the vector (sinθ)**i**+(cosθ)**j** is perpendicular to the vector **i**-√3**j** then θ= (2000)
1)π/6 2)π/5 3)π/4 4)π/3

76. If two out of the three vectors a,b,c are unit vector, **a+b+c**=0 and 2(**a.b+b.c+c.a**)+3=0, then the third vector is of length (2000)
1)3 2)2 3)1 4)0

77. If θ is the angle between the vector **2i+2j+4k** and **3i+j+2k**, then sinθ= (2000)

1)2/7 2)2/√7 3) $\sqrt{2/7}$ 4) √2/7

78. If **a=2i+3j-4k,b=i+j+k** and **c=4i+2j+3k** then |**a x(b x c)**| = (2000)
1)√10 2)1 3)2 4)√5

79. **(bxc) x (cxa**)= (2000)
1)[abc]c 2)[**abc]b** 3)[**abc]a** 4)**ax(bxc)**

80. If the four vectors a,b,c,d are coplanar, then (axb)x(cxd)= (2001)
1)1 2)a 3)b 4)0

81. If **a**=-**i**+**j**+t**k** and **b**=-**i**+2**j**+3**k** then the values of t for which **a**+**b** and **a-b** are perpendicular are (2001)
1)±2 2)±2√2 3)±2√3 4)±3

82. If |**a x b**|=|**a.b**| then (**a.b**)= (2001)
1)0 2)π 3)π/2 4)π/4

83. The orthogonal projection of a on b is (2002)
1)$\frac{(\mathbf{a}.\mathbf{b})\mathbf{a}}{|\mathbf{a}|^2}$ 2)$\frac{(\mathbf{a}.\mathbf{b})\mathbf{b}}{|\mathbf{b}|^2}$ 3)$\frac{\mathbf{a}}{|\mathbf{a}|}$ 4)$\frac{\mathbf{b}}{|\mathbf{b}|}$

84. If **a.i**=**a**.(**i**+**j**)=**a**.(**b+k**)=1 then **a**= (2002)
1)i 2)**j** 3)**k** 4)**i+j+k**

85. The vector area of the ΔABC whose vertices are **a,b,c** is (2003)
1){(**a x b)+(b x c)+(c xa**)} 2)**1/2**{(**a x b)+(b x c)+(c x a**)}
3)2{(**a x b)+(b x c)+(c x a**)} 4)none of these

86. If **a=i+j+k, b=i+j,c=i** and (**a xb) xc** =λ**a**+μ**b,** then λ+μ= (2003)

1)0 2)1 3)2 4)3

87. If the vectors **i**+3**j**+4**k**, λ**i**-4**j**+λk are orthogonal to each other, then λ= (2004)
1)5 2)-5 3)8 4)-8

88. **c.(b+c) x (a+b+c)_=** (2004)
1)c.b x a 2)0 3)**c.a x b** 4)**-a.c x b**

89. **If 3i+3j+√3k, i+k,√3i+√3j+λk are coplanar, then λ= (2004)**
1)1 2)2 3)3 4)4

90. If **a** and **b** are unit vectors, then the vector(**a+b**)x (**axb**) is parallel to the vector
1)**a-b** 2)**a**+**b** 3)2**a-b** 4)2**a**+**b** (2005)

91. Observe the following lists (2005)

List-I		**List-II**
A)[**abc**]	1.	|**a**| |**b**| cos(**ab)**
B)(**cxa)xb**	2.	**(a.c)b-(a.b)c**
C)**ax(bxc)**	3.	**a.bxc**
D)**a.b**	4.	|**a**| |**b**|
	5.	**(b.c)a – (a.b)c**

Then the correct match for List I from List II is:

	A	B	C	D
1)	1	2	3	4
2)	3	5	2	1
3)	3	2	5	1
4)	2	3	4	1

92. If $\vec{a} + \vec{b} + \vec{c} = 0$ and |a| = 3, |b|=4 and |c|=√37, then the angle between $\vec{a}$ and $\vec{b}$ is (2006)
1)π/4 2)π2 3)π/6 4)π/3

93.. The position vector of a point lying on the line joining the points whose position vectors are
$\vec{i} + \vec{j} - \vec{k}$ and $\vec{i} - \vec{j} + \vec{k}$ is: (2006)
1)$\vec{j}$ 2)$\vec{i}$ 3)$\vec{k}$ 4)0

94. If $\vec{i} - 2\vec{j}$, $3\vec{j} + \vec{k}$ and $\lambda\vec{i} + 3\vec{j}$ are coplanar, then λ= (2006)
1)-1 2)1/2 3)-3/2 4)2

95. If the volume of the parallelepiped with coterminous edges $4\vec{i} + 5\vec{j} + \vec{k}$ and

$3\vec{i} + 9\vec{j} + \overrightarrow{pk}$ is 34 cubic units, then p=__ (2006)

1)4 2)-13 3)13 4)6

96. a . $\bar{i}$= $\bar{a}$.(2 $\bar{i}$+ $\bar{j}$)= $\bar{a}$.(i $\bar{+}$ $\bar{j}$+3 $\bar{k}$)=1⇒ $\bar{a}$=__ (2006)

1) $\bar{i}$- $\bar{k}$ 2)1/3(3 $\bar{i}$+3 $\bar{j}$+ $\bar{k}$) 3)1/3($\bar{i}$+ $\bar{j}$+ $\bar{k}$) **4)1/3(3 $\bar{i}$-3 $\bar{j}$+ $\bar{k}$)**

97. Let **a** = a_1 i + a_2 j +a_3**k**. (2007)

A: The identity $|\mathbf{a} \times \mathbf{i}|^2 + |\mathbf{a} \times \mathbf{j}|^2 = 2|\mathbf{a}|^2$ holds for **a.**

R: **a x i = a**$_3$ j –a_2 k, **a x j = a**$_1$k –a_3 **i, a x k= a**$_2$ j –a_1 j

Which of the following is correct?

1) Both **A &R** are true and **R** is the correct reason for **A**
2) Both **A &R** are true **R** is not the correct reason for **A**
3) **A** is true, **R** is false
4) **A** is false **R** is true.

98. **a = i – j - k and b = λI - 3j + k** and the orthogonal projection of **b** on **a is** $\frac{4}{3}$(i-j-k), then λ = (2007)

1)0 **2)2** 3)12 4)-1

99. Let **a** be a unit vector, **b=2i=j-k** and **c=i+3k**.The maximum value of **[a b c] is (2008)**

1)-1 2) $\sqrt{10}+\sqrt{6}$ 3) $\sqrt{10}-\sqrt{6}$ 4)√59

100. If **a=i+j+k ,b=i-j+k,c=i**+j-**k,d=i-j-k** then observe the following lists: (2008)

List-I	List-II
i)**a.b**	A)**a.d**
ii)b.c	B)3
iii)**[a b c]**	C)**b.d**
iv)**bxc**	D)2**j**-2**k**
	E)2j+2k
	F)4

The correct match of List I to List II is

	i	ii	iii	iv		i	ii	iii	iv
1)	C	A	B	F	3)	C	A	F	E
3)	A	C	B	F	4)	A	C	F	D

1)1 2)2 3)3 4)4

101. Suppose $\vec{a} = \lambda\vec{i} - 7\vec{j} + 3\vec{k}$, $\vec{b} = \lambda\vec{i} + \vec{j} + 2\lambda\vec{k}$. If the angle between $\vec{a}$ and $\vec{b}$ is greater than 90^0, then λ satisfies the inequality: [2009]

1) –7 < λ < 1 2) λ > 1 3) 1 < λ < 7 4) –5 < λ < 1

102. The volume of the tetrahedron having the edges $\vec{i}+2\vec{j}-\vec{k}, \vec{i}+\vec{j}+\vec{k}, \vec{i}+\vec{j}+\lambda\vec{k}$, as conterminous, is 2/3 cubic units. Then λ [2009]

1) 1 2) 2 3) 3 4) 4

103. $\left(\vec{a}+2\vec{b}-\vec{c}\right).\left(\vec{a}-\vec{b}\right)\times\left(\vec{a}-\vec{b}-\vec{c}\right)=$ [2009]

1) $-\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ 2) $2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ 3) $3\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ 4) $\vec{0}$

104. $\vec{u}=\vec{a}-\vec{b}, \vec{v}=\vec{a}+\vec{b}, \left|\vec{a}\right|=\left|\vec{b}\right|=2 \Rightarrow \left|\vec{u}\times\vec{v}\right|=$ [2010]

1) $2\sqrt{16-\left(\vec{a}.\vec{b}\right)^2}$ 2) $\sqrt{16-\left(\vec{a}.\vec{b}\right)^2}$ 3) $2\sqrt{4-\left(\vec{a}.\vec{b}\right)^2}$ 4) $\sqrt{4-\left(\vec{a}.\vec{b}\right)^2}$

105. If the angle θ between the vectors $\vec{a}=2x^2\vec{i}+4x\vec{j}+\vec{k}$ and $\vec{b}=7\vec{i}-2\vec{j}+x\vec{k}$ is such that $90^\circ<\theta<180^0$ then x lies in the internal : [2010]

1) $\left(0,\frac{1}{2}\right)$ 2) $\left(\frac{1}{2},1\right)$ 3) $\left(1,\frac{3}{2}\right)$ 4) $\left(\frac{1}{2},\frac{3}{2}\right)$

106. Let OA, OB, OC be the co – terminal edges of a rectangular parallelepiped of volume V and let P be the vertex opposite to O, then $\left[\overrightarrow{AP}\,\overrightarrow{BP}\,\overrightarrow{CP}\right]=$ [2010]

1) 2V 2) 12V 3) $3\sqrt{3}V$ 4) 0

107. For any vector $\bar{r}$, $\bar{i}\times\left(\bar{r}\times\bar{i}\right)\times\bar{j}\times\left(\bar{r}\times\bar{j}\right)+\bar{k}\times\left(\bar{r}\times\bar{k}\right)=$ (2011)

1) $\bar{0}$ 2) $2\bar{r}$ 3) $3\bar{r}$ 4) $4\bar{r}$

108. If $\left|\bar{a}\right|=1, \left|\bar{b}\right|=2$ & the angle between $\bar{a}$ & $\bar{b}$ is 120^0, then $\{\left(\bar{a}+3\bar{b}\right)\times\left(3\bar{a}-\bar{b}\right)\}^2=$ (2011)

1) 425 2) 275 3) 325 4) 300

109. If the vectors $\bar{i}-2x\bar{j}-3y\bar{k}$ and $\bar{i}+3x\bar{j}+2y\bar{k}$ are orthogonal to each other, then the locus of the point (x, y) is (2011)

1) A circle 2) An ellipse 3) A parabola 4) A straight line

110. The magnitude of the projection of the vector $\bar{a}=4\bar{i}-3\bar{j}+2\bar{k}$ on the line which makes equal angles with the coordinate axes is (2011)

1) $\sqrt{2}$ 2) $\sqrt{3}$ 3) $\frac{1}{\sqrt{3}}$ 4) $\frac{1}{\sqrt{2}}$

111. Let $\bar{v}=2\bar{i}+\bar{j}-\bar{k}$ and $\bar{w}=\bar{i}+3\bar{k}$. If $\bar{u}$ is any vector then the maximum value of the scalar triple product $\left[\bar{u}\ \bar{v}\ \bar{w}\right]$ is (2011)

1) 1 2) $\sqrt{10}+\sqrt{6}$ 3) $\sqrt{59}$ 4) $\sqrt{60}$

112. Let $\vec{a}=\vec{i}+2\vec{j}+\vec{k},\ \vec{b}=\vec{i}-\vec{j}+\vec{k}$ and $\vec{c}=\vec{i}+\vec{j}-\vec{k}$ A vector in the plane of $\vec{a}$ and $\vec{b}$ has projection $\frac{1}{\sqrt{3}}$ on $\vec{c}$. Then, one such vector is(2012)

1) $4\vec{i}+\vec{j}-4\vec{k}$ 2) $3\vec{i}+\vec{j}-3\vec{k}$ 3) $4\vec{i}-\vec{j}+4\vec{k}$ 4) $2\vec{i}+\vec{j}-2\vec{k}$

113. If p^{th}, q^{th}, r^{th} terms of a geometric progression are the positive numbers a, b, c respectively, then the angle between the vectors $\left(\log a^2\right)\bar{i}+\left(\log b^2\right)\bar{j}+\left(\log c^2\right)\bar{k}$ and $(q-r)\bar{i}+(r-p)\bar{j}+(p-q)\bar{k}$ is(2012)

1) $\frac{\pi}{3}$ 2) $\frac{\pi}{2}$ 3) $\sin^{-1}\frac{1}{\sqrt{a^2+b^2+c^2}}$ 4) $\frac{\pi}{4}$

114. The shortest distance between the lines $\vec{r}=3\vec{i}+5\vec{j}+7\vec{k}+\lambda\left(\vec{i}+2\vec{j}+\vec{k}\right)$ & $\vec{r}=-\vec{i}-\vec{j}-\vec{k}+\mu\left(7\vec{i}-6\vec{j}+\vec{k}\right)$ is (2013)

1) $\frac{16}{5\sqrt{5}}$ 2) $\frac{26}{5\sqrt{5}}$ 3) $\frac{36}{5\sqrt{5}}$ 4) $\frac{46}{5\sqrt{5}}$

115. If $\vec{a}$ & $\vec{b}$ are two non – zero perpendicular vectors, then a vector $\vec{y}$ satisfying equations $\vec{a}.\vec{y}=\vec{c}$ (c sclar) & $\vec{a}\times\vec{y}=\vec{b}$ (2013)

1) $\left|\vec{a}\right|^2\left(\overrightarrow{ca}\right)-\left(\vec{a}\times\vec{b}\right)$ 2) $\left|\vec{a}\right|^2\left(\overrightarrow{ca}+\left(\vec{a}\times\vec{b}\right)\right)$

3) $\frac{1}{\left|\vec{a}\right|^2}\left(\overrightarrow{ca}-\left(\vec{a}\times\vec{b}\right)\right)$ 4) $\frac{1}{\left|\vec{a}\right|^2}\left(\overrightarrow{ca}+\left(\vec{a}\times\vec{b}\right)\right)$

116. Let $\vec{a},\vec{b}\ and\ \vec{c}$ be three non-coplanar vectors and let $\vec{p},\vec{q}\ and\ \vec{r}$ be the vectors defined by $\vec{p}=\frac{\vec{b}\times\vec{c}}{\left[\vec{a}\vec{b}\vec{c}\right]}$, $\vec{q}=\frac{\vec{c}\times\vec{a}}{\left[\vec{a}\vec{b}\vec{c}\right]}$, $\vec{r}=\frac{\vec{a}\times\vec{b}}{\left[\vec{a}\vec{b}\vec{c}\right]}$ then

$\left(\vec{a}+\vec{b}\right).\vec{p}+\left(\vec{b}+\vec{c}\right).\vec{q}+\left(\vec{c}+\vec{a}\right).\vec{r}=$ (2012)

1) 0 2) 1 3) 2 4) 3

117. $\vec{a}=\vec{i}+\vec{j}-2\vec{k}\Rightarrow\sum\left\{\left(a\times\vec{i}\right)\times\vec{j}\right\}^2=$ (2012)

1) $\sqrt{6}$ 2) 6 3) 36 4) $6\sqrt{6}$

118. The vectors $\overrightarrow{AB}=3\vec{i}-2\vec{j}+2\vec{k}$ and $\overrightarrow{BC}=-\vec{i}-2\vec{k}$ are the adjacent sides of a parallelogram. The angle between its diagonals is (2012)

1) $\frac{\pi}{2}$ 2) $\frac{\pi}{3} or \frac{2\pi}{3}$ 3) $\frac{3\pi}{4} or \frac{\pi}{4}$ 4) $\frac{5\pi}{6} or \frac{\pi}{6}$

119. $\vec{a} \neq 0, \vec{b} \neq 0, \vec{c} \neq 0, \vec{a} \times \vec{b} = \vec{0}, \vec{b} \times \vec{c} = \vec{0} \Rightarrow \vec{a} \times \vec{c} =$ (2013)

1) $\vec{b}$ 2) $\vec{a}$ 3) $\vec{0}$ 4) $\vec{i}+\vec{j}+\vec{k}$

120. A unit vector coplanar with $\vec{i}+\vec{j}+3\vec{k}$ & $\vec{i}+3\vec{j}+\vec{k}$ & perpendicular to $\vec{i}+\vec{j}+\vec{k}$ is [2013]

1) $\frac{1}{\sqrt{2}}\left(\vec{j}+\vec{k}\right)$ 2) $\frac{1}{\sqrt{3}}\left(\vec{i}-\vec{j}+\vec{k}\right)$ 3) $\frac{1}{\sqrt{2}}\left(\vec{j}-\vec{k}\right)$ 4) $\frac{1}{\sqrt{3}}\left(\vec{i}+\vec{j}-\vec{k}\right)$

121. The angle between the lines $\bar{r} = (2i - 3j + k) + \lambda(i + 4j + 3k)$ & $\bar{r} = (i - j + 2k) + \mu(i + 2j - 3k)$ is (2014)

1) $cos^{-1}\left(\frac{9}{\sqrt{91}}\right)$ 2) $cos^{-1}\left(\frac{7}{\sqrt{84}}\right)$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{2}$

122. If $\bar{a}, \bar{b}$ & $\bar{c}$ are vectprs with magnitudes 2, 3 & 4 respectively then the best upper bound of $|\bar{a}-\bar{b}|^2 + |\bar{b}-\bar{c}|^2 + |\bar{c}-\bar{a}|^2$ among the given values is (2014)

1) 97 2) 87 3) 90 4) 93

123. If x, y, z are non – zero real numbers, $\bar{a} = x\bar{i} + 2\bar{j}, \bar{b} = y\bar{j} + 3\bar{k}$ & $\bar{c} = x\bar{i} + y\bar{j} + z\bar{k}$ are such that $\bar{a} \times \bar{b} = 2\bar{i} - 3\bar{j} + \bar{k}$ then $\left[\bar{a}\bar{b}\bar{c}\right] =$ (2014)

1) 10 2) 9 3) 6 4) 3

124. The shortest distance between the skew lines $\bar{r} = \left(\bar{i} + 2\bar{j} + 3\bar{k}\right) + t\left(\bar{i} + 3\bar{j} + 2\bar{k}\right)$ & $\bar{r} = \left(4\bar{i} + 5\bar{j} + 6\bar{k}\right) + t\left(2\bar{i} + 3\bar{j} + \bar{k}\right)$ is (2014)

1) 3 2) $2\sqrt{3}$ 3) $\sqrt{3}$ 4) $\sqrt{6}$

125. The position vectors of the vertices ΔABC are 3i + 4j + k, 3j + k, 5(i + j + k) respectively. The magnitude of the altitude from A onto the side BC is (2015)

1) $\frac{4}{3}\sqrt{5}$ 2) $\frac{5}{3}\sqrt{5}$ 3) $\frac{7}{3}\sqrt{5}$ 4) $\frac{8}{3}\sqrt{5}$

126. The shortest distance between the skew lines $\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1}$, $\frac{x-1}{1} = \frac{y+7}{3} = \frac{z+2}{2}$ (2015)

1) 6 2) 7 3) $3\sqrt{5}$ 4) $\sqrt{35}$

127. If a = 2i – 3j + 5k, b = 3i – 4j + 5k & c = 5i – 3j – 2k, then the volume of the parallelepiped with co – terminus edges a + b, b + c, c + a is (2015)
1) 1 2) 5 3) 8 4) 16

128. If $\bar{a} = 2i + k$ $\bar{b} = i + j + k$ $\bar{c} = 4i - 3j + 7k$ then the vector $\bar{r}$ satisfying $\bar{r} \times \bar{b} = \bar{c} \times \bar{b}$ & $\bar{r}.\bar{a} = 0$ is (2015 A.P.)
1) i + 8j + 2k 2) i – 8j + 2k 3) i – 8j – 2k 4) –i – 8j + 2k

129. If $\bar{a}, \bar{b}, \bar{c}$ are three vectors such that $|\bar{a}| = 1, |\bar{b}| = 2, |\bar{c}| = 3,$ & $\bar{a}.\bar{b} = \bar{a}.\bar{c} = \bar{c} = \bar{a} = 0,$ then $\left|\left[\bar{a}\bar{b}\bar{c}\right]\right| =$ ([2015 A.P.)
1) 0 2) 2 3) 3 4) 6

130. If $\left[\bar{a} \times \bar{b}\, \bar{b} \times \bar{c}\, \bar{c} \times \bar{a}\right] = \lambda\left[\bar{a}\bar{b}\bar{c}\right]^2$, then $\lambda =$ (2015 A.P.)
1) 0 2) 1 3) 2 4) 3

131. The Cartesian equation of the plane passing through the point (3, 2, -1) & parallel to the vectors $\bar{b} = i - 2j + 4k$ & $\bar{c} = 3i + 2j - 5k$ is (2015 A.P.)
1) 2x – 17y – 8z + 63 = 0 2) 3x + 17y + 8z – 36 = 0
3) 2x + 17y + 8z + 36 = 0 4) 3x – 16y + 8z – 63 = 0

132. The vectors 2i – 3j + k, i – 2j + 3k, 3i + j – 2k (2016)
1) Are linearly dependent 2) Are linearly independent
3) Form sides of a triangle 4) Are coplanar

133. a, b, c are three vectors such that |a| = 1, |b| = 2, |c| = 3& b, c are perpendicular. If projection of b on a is the same as the projection of c on a, then |a – b + c| = (2016)
1) $\sqrt{2}$ 2) $\sqrt{7}$ 3) $\sqrt{14}$ 4) $\sqrt{10}$

134 If a, b, c are unit vectors satisfying the relation a + b + $\sqrt{3}c$ = 0 then the angle between a & b is (2016)
1) $\frac{\pi}{6}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{2}$

135. a is perpendicular to both b & c. The angle between b & c is $\frac{2\pi}{3}$ If |a| = 2, |b| = 3, |c| = 4, then c.(axb) = (2016)
1) $18\sqrt{3}$ 2) $12\sqrt{3}$ 3) $8\sqrt{3}$ 4) $6\sqrt{3}$

136. If |a| = 3, |b| = 4 & the angle between a & b is 120^0, then |4a + 3b| is equal to (2016AP)

1) 25 2) 7 3) 13 4) 12

137. If a, b, c are non – zero vectors such that $(a\times b)\times c=\frac{1}{3}|b||c|a, c\perp a$ & θ is the angle between the vectors b, c then $\sin\theta=$ (2016AP)

1) $\frac{2\sqrt{2}}{3}$ 2) $\frac{1}{3}$ 3) $\frac{\sqrt{2}}{3}$ 3) $\frac{2}{3}$

138. If $a(\alpha\times\beta)+b(\beta\times\gamma)+c(\gamma\times\alpha)=0$ & atleast one of the scalars a, b, c is non zero then the vectors α,β,γ are (2016AP)

1) Parallel 2) Non coplanar
3) Coplanar 4)Mutually perpendicular

139. If $\vec{a}$ is a unit vector, then $|a\times i|^2+|a\times j|^2+|a\times k|^2=$ (2017)

1) 2 2) 4 3) 1 4) 0

140. If a = xi + yj + zk then (a x i).(i + j) + (axj).(j + k) + (a x k).(k + i) (2017)

1) x – y + z 2) x + y + z 3) x + y – z 4) –x + y + z

141. If a, b & c are unit vectors such that a + b + c = 0 & $(a,b)=\frac{\pi}{3}$, then $|a\times b|+|b\times c|+|c\times a|=$ (2017)

1) $\frac{3}{2}$ 2) 0 3) $\frac{3\sqrt{3}}{2}$ 4) 3

142. If a & b are unit vectors & α is the angle between them, a + b is a unit vector when $\cos\alpha=$ (2017)

1) $-\frac{1}{2}$ 2) $\frac{1}{2}$ 3) $-\frac{\sqrt{3}}{2}$ 4) $\frac{\sqrt{3}}{2}$

143. Let a = 2i + j – 3k & b = i + 3j + 2k. Then the volume of the parallelepiped having coterminous edges as a, b & c where c is the vector perpendicular to the plane of a, b & |c| = 2 is (2017)

1) $2\sqrt{195}$ 2) 4 3) $\sqrt{200}$ 4) $\sqrt{195}$

144. Given a = 2i + j – 2k & b = i + j. If c is a vector such that a.c = |c|, |c – a| = $2\sqrt{2}$ & the angle between a x b & c is 30^0, then the value of $|(a \times b) \times c|^2$ is

1) 9 2) $\frac{4}{9}$ 3) $\frac{9}{4}$ 4) $\frac{27}{4}$

145. If in a right angled triangle ABC, the hypotenuse $\left|\overline{AB}\right| = p$ then $\overline{AB}.\overline{AC} + \overline{BC}.\overline{BA} + \overline{CA}.\overline{CB} =$

1) p^2 2) $2p^2$ 3) $3p^2$ 4) $p^2 / 2$

146. Let a = 2i + j – k & b = I + 3k. If c is a unit vector, then the maximum value of [a b c] is

1) $\sqrt{39}$ 2) $\sqrt{49}$ 3) $\sqrt{69}$ 4) $\sqrt{59}$

147. Let a = 4i + 5j – k, b = i – 4j + 5k, c = 3i + j – k & let $\overline{\alpha}$ be a vector perpendicular to both a & b such that $\overline{\alpha}.c = 63$. Then $\overline{\alpha} =$

1) 7i – 7j – 7k 2) 3i – 3j – 3k
3) 21i – 21j – 21k 4) 21i – 7j – 7k

KEYS

1)	2) **1**	3) **3**	4) **3**	5) **2**	6) **4**	7) **2**	8) **4**	9) **1**	10) **2**
11) **2**	12) **1**	13) **1**	14) **2**	15) **1**	16) **3**	17) **1**	18) **1**	19) **3**	20) **1**
21) **4**	22) **4**	23) **1**	24) **3**	25) **4**	26) **1**	27) **3**	28) **1**	29) **2**	30) **3**
31) **1**	32) **1**	33) **4**	34) **1**	35) **3**	36) **1**	37) **2**	38) **4**	39) **1**	40) **2**
41) **2**	42) **3**	43) **4**	44) **3**	45) **1**	46) **4**	47) **2**	48) **4**	49) **2**	50) **3**
51) **3**	52) **4**	53) **3**	54) **4**	55) **2**	56) **1**	57) **3**	58) **2**	59) **4**	60) **1**
61) **3**	62) **2**	63) **1**	64) **3**	65) **2**	66) **1**	67) **1**	68) **4**	69) **1**	70) **1**
71) **2**	72) **1**	73) **2**	74) **2**	75) **4**	76) **3**	77) **2**	78) **4**	79) **1**	80) **4**
81) **2**	82) **4**	83) **2**	84) **1**	85) **2**	86) **1**	87) **3**	88) **1**	89) **4**	90) **1**
91) **2**	92) **4**	93) **2**	94) **3**	95) **2**	96) **4**	97) **4**	98) **2**	99) **4**	100) **2**
101) **1**	102) **1**	103) **1**	104) **3**	105) **1**	106) **1**	107)	108)	109) **1**	110) **2**
111)	112) 3	113) 2	114) 4	115) 3	116) 4	117) **2**	118) **3**	119)	120) **3**
121) 4	122) 2	123) 2	124) 3	125) 1	126) 4	127) **4**	128) **4**	129) **4**	130) **2**
131) 3	132) 2	133) 2	134) 3	135) 2	136) 4	137) **1**	138) **3**	139) **2**	140) **2**
141) 3	142) 1	143) 1	144) 3	145) 1	146) 3	147) **3**	148)	149)	150)

AIEEE PROBLEMS

1. Let $u = i+j \cdot v = -j$, $w = i + 2j + 3k$. If n is a unit vector such that $u \cdot n = 0$, $v \cdot n = 0$ then $| w \cdot n| =$ [2003]
   1) 0 2) 1 3) 2 4) 3

2. If u and v are unit vectors and θ is the acute angle between them, then $2u \times 3v$ is a unit vector for [2007]
   1) exactly two values of θ 2) more than two values of θ
   3) no value of θ 4) exactly one value of θ

3. If a is any vector then $(a \times i)^2 + (a \times j)^2 + (a \times k)^2 =$ [2005]
   1) a^2 2) $2a^2$ 3) $3a^2$ 4) $4a^2$

KEYS

1) **4**	2) **4**	3) **2**	

6. TRIGONOMETRIC FUNCTIONS

1. $\pi = 22/7 = 3.14$

2. $\pi = \dfrac{\text{Circumference of a circle}}{\text{diameter of the circle}}$

3. π is an irrational number

4. $1^0 = \pi/180$ radian = 0.01745 radian

5. $\sin\theta \operatorname{cosec}\theta = 1$

6. $\tan\theta \cot\theta = 1$

7. $\cos\theta \sec\theta = 1$

8. $\tan\theta = \sin\theta/\cos\theta$, $\cot\theta = \cos\theta/\sin\theta$

9. $\sin^2\theta + \cos^2\theta = 1$

10. $\sec^2\theta - \tan^2\theta = 1$

11. $\operatorname{cosec}^2\theta - \cot^2\theta = 1$

12. If two angles differ by an integral multiple of 360^0, then they are called conterminal angles.
    Eg: 750^0 and 30^0, 340^0 and -20^0, -300^0 and 60^0

13. Circular functions:- $\sin\theta$, $\cos\theta$, $\tan\theta$, $\operatorname{cosec}\theta$, $\sec\theta$ and $\cot\theta$ are called circular functions.

14. $\sin 15^0 = \dfrac{\sqrt{3-1}}{2\sqrt{2}}$

    $\cos 15^0 = \dfrac{\sqrt{3+1}}{2\sqrt{2}}$

    $\tan 15^0 = 2-\sqrt{3}$

    $\cot 15^0 = 2+\sqrt{3}$

15. $\text{Sin } 18^0 = \dfrac{\sqrt{5-1}}{4}$

$\text{Cos}18^0 = \frac{\sqrt{10+2\sqrt{5}}}{4}$

16. $\text{Sin } 36^0 = \frac{\sqrt{10-2\sqrt{5}}}{4}$

$\text{Cos } 36^0 = \frac{\sqrt{5+1}}{4}$

Exercise-A

1. If 'θ' is acute, $\tan\theta = 1/\sqrt{7} \Rightarrow \frac{\cos ec^2\theta - Sec^2\theta}{\cos ec^2\theta + \sec^2\theta} =$
   1)3/4 2)1/2 3)2 4)5/4

2. $a\cos\theta = b\sin\theta$, $a\cos^3\theta + b\sin^3\theta = \sin\theta.\cos\theta \Rightarrow a^2 + b^2 =$
   1)1/2 2)1 3)3/2 4)2

3. $\sin 18^0 \cos 36^0$
   1)1/2 2)-1/4 3) 1/16 4)1/4

4. $\cos 18^0 \ \sin 36^0$
   1)√5/2 2) √5/4 3) -√5/2 4) -√5/4

5. $\sin 15^0 + \cos 15^0$
   1)√3/2 2) 1/2 3) √3/2 4) 1/√2

6. $\tan 75^0 + \cot 75^0$
   1)1 2)2 3) 1/√2 4)4

7. If $\frac{\sin(A+B)}{\sin(A-B)} = a/b$ then tanA cot B=_____
   1) a+b 2)a-b 3) a+b/a-b 4) a-b/a+b

8. $\frac{\cos(A+B)}{\cos(A-B)} = n$ then cot A cot B =_____
   1) n+1/n-1 2)n-1/n+1 3) 1+n/1-n 4) 1-n/1+ n

9. cosec A + cot A=5 , sin A=____
   1)13/5 2)1 /5 3) 5 4) 5/13

10. Sec A+ tan A = (a+1) /(a-1), cos A =_____

1)$(a^2+1)/(a^2-1)$ 2) $2a/(2+1)$ 3)$(a^2-1)/(a^2+1)$ 4) $(a^2+1)/2a$

11. (1-sin A) (1-sinB) (1-sinC) = (1+sinA) (1+sinB) (1+sinC). Each is equal to __
1) +cosA sin B sinC 2) $\pm$ cos A cos B cos C
3) $\pm$cos B sin A sinC 4) $\pm$sinA sin B sinC

12. $\frac{\text{sec A+ tan A-1}}{\text{1-secA+tanA}}$ =
1) Sec A 2) TanA 3) secA+tanA 4) secA-tanA

13. If x= tan θ +sin θ, y = tan θ - sin θ then x^2-y^2=____

1)1 2) $4\sqrt{xy}$ 3) $2\sqrt{xy}$ 4)$\sqrt{xy}$

14. $\sqrt{\text{1-CosA/ 1+CosA}} + \sqrt{\text{1+CosA / 1-CosA}}$ =
1)cosecA 2)2sinA 3)sinA 4)2cosecA

15. Sin (A+B) =1, cos (A-B) =1/2 A=_____ , B=_____
1) 75^0 , 15 2) 15^0, 75^0 3) 90^0 , 65^0 4) 30^0, 90^0

16. Sin (A+B-C) = Cos (A-B+C) = tan (B+C-A) =1,find A, B and C.
1) 45^0, 22 ½ ^{0}, 67 1/2^0 2) 45^0, 67 1/2^0, 22 1/2^0
3) 45^0,90^0,30^0 4) 22 1/2^0,45^0,67 1/2^0
[If A+B=45^0 or 225^0 then (1+tan A) (1+tan B) =2 and (cot A-1) (cot B-1) =2]

17. $\frac{(1+\tan 11^0)\ (1+\tan 34^0)}{(1+\tan 12^0)\ (1+\tan 33^0)}$ =
1)2 2) -2 3) 1 4)4

18. (1- cot 27^0) (1-cot 18^0) =_____
1) 2 2) 3 3) 4 4)1

19. (1-cot 35^0) (cot 10^0-1)=_____
1) 1 2)- 2 3) 3 4)-2

20. (1+ tan 170^0) (1+ tan 55^0) =____
1) 1 2) 2 3)3 4) 4

21. (1+tan 70^0) (1-tan25^0)=_____
1) 1 2) 0 3)-1 4) 2

22. cos (40^0 + θ) + cos (120^0 + θ) + cos (220^0 + θ) +cos (300^0 + θ) =_____

1)0 2) 1 3) 2cos (40+θ) 4) 2 cos θ

23. $\cos 5^0 + \cos 24^0 + \cos 175^0 + \cos 204^0 + \cos 300^0 =$____
1)0 2)1/2 3)√3/2 4)1

24. $1+ \cos \pi /7 + \cos 2\pi /7 + \cos 3\pi/7 + \cos 4\pi/7+ \cos 5\pi/7 + \cos 6\pi/7=$_____
1)1 2)0 3)-1 4)2

25. $\sin 5^0 + \sin 10^0 + \sin 15^0 + \ldots\ldots + \sin 355^0 =$_____
1)1 2)2 3)3 4)0

26. $\text{Cos}10^0 + \text{Cos } 20^0 + \ldots + \text{Cos } 170^0 =$ _____
1)1 2)0 3)3 4)2

27. $\tan 5^0 + \tan 10^0 + \ldots + \tan 90^0=$_____
1)1 2) ∞ 3)- ∞ 4)2

28. $(\tan 80^0-1)\ (\tan 55^0-1) =$_____[If A+B=135 then (1-tanA)(1-tanB)=2]
1)1 2)-1 3)2 4)-2

29. $(1- \tan 70^0)\ (\tan 65^0-1) =$_____
1)1 2)-1 3)2 4)-2

30. $\dfrac{1+\tan 70^0}{1- \cot 80^0} \cdot \dfrac{1-\tan 25^0}{1+ \cot 35}$
1)2 2)3 3)4 4)1

31. A Q.E whose roots are $\sin 18^0$ and $\cos 36^0$ is _____
1)$4x^2-\sqrt{5}x+1$ 2)$4x^2+\sqrt{5}x-1$ 3)$4x^2-2\sqrt{5}x+1$ 4)$2\sqrt{5}x^2-4x+1$

32. If $\dfrac{1 - \tan 2^0 \cot 62}{\tan 152^0 - \cot 88^0} = k\sqrt{3}$ then k=_____
1)1 2)-1 3) 2 4)3

33. $\tan 18^0 + \tan 27^0 + \tan 18\ \tan 27^0 =$_____
1)1 2)2 3)3 4)4

34. $\tan 40^0 + \tan 80^0 - \sqrt{3}\ \tan 40^0\ \tan 80^0$_____
1)1 2)1/2 3) √3/2 4)- √3

35. $\sqrt{3}\ (\tan 11 + \tan 19) + \tan 11 \tan 19=$_____
1)1/2 2)1/√3 3) √3/2 4) √3

36. tan 65 - tan 20 – tan 65 tan 20 =_____
1)2 2)3 3)1 4)-1

37. If $\sin\theta = x\cos\phi$ and $\cos\theta = y\sin\phi$ then $\cos^2\phi$=_____
1)$\frac{y^2(x^2-1)}{x^2-y^2}$ 2) $\frac{y^2-1}{x^2-y^2}$ 3) $\frac{1-y^2}{x^2-y^2}$ 4)$\frac{1+y^2}{x^2-y^2}$

38. If $\cos x=\cos y$ $(x\neq y)$ then a possible value of $\cos(x+y)$ is ____
1)0 2)1 3)sin2y 4)siny

39. If $A=\cos15^0-\cos75^0$, $B=\tan15^0+\tan75^0$, $C=\cos^2 45^0-\sin^2 15^0$ then ascending order is
1)A,B,C 2)C,A,B 3)B,C,A 4)C,B,A

40. I: If tanA+tanB = p and cotA+cotB = q then cot(A+B) = (q-p)/(pq)
II: If 2tan A+cotA = tanB then cotA+2tan(A-B) = 0
1)only I is true 2)only II is true
3)both I&II are true 4)neither I nor II are true

41. $\log \sin1^0 . \log\sin2^0 ..... \log\sin179^0 .....=$
1)1 2)0 3)-1 4)2

42. $(\sqrt{1-\sin^2 100})\ \mathrm{Sec}100^0$
1)-1 2)0 3)1 4)2

43. $\mathrm{Sec}\alpha = 5x + (1/20x) \Rightarrow \mathrm{Sec}\alpha + \tan\alpha =$
1)5x 2)1/20x 3)10x 4)10x

44. Eliminate θ, $x= a\cos\theta$, $y = b\sin\theta$
1) $x^2/a^2+y^2/b^2=1$ 2) $x^2/a^2-y^2/b^2=1$ 3) $x^2/a^2+y^2/b^2=2$ 4) $x^2/a^2-y^2/b^2=2$

45. $\sin\beta = 2mn/m^2+n^2 \Rightarrow \mathrm{cosec}\,\beta - \cot\beta$
1)m/n 2)n/m 3)2m/n 4)2n/m

PREVIOUS EAMCET PAPER'S PROBLEMS

46. $\mathrm{Cos}^2\, 3\pi/5 + \cos^2 4\pi/5$=____ [1996]
1)3/2 2)3/4 3)2/3 4)4/3

47. If $x= r\cos\alpha\cos\beta\cos\gamma$, $y= r\cos\alpha\cos\beta\sin\gamma$
$z= r\sin\alpha\cos\beta$ and $\mu = r\sin\beta$ then $x^2+y^2+z^2+\mu^2$=_____ [1996]
1)r^2 2)r 3)1/r 4)$1/r^2$

48. $\tan 1^0 . \tan2^0 . \tan3^0 ..... \tan 89^0$=_____ [1996]

1)1 2)2 3)-1 4)1/2

49. If $\sin^2 x = 1-\sin x$ then $\cos^4 x + \cos^2 x =$__ [1996]
1)1 2)$2\sin^2 x$ 3)$\sin x$ 4)$\sin^2 x$

50. $\cos 15^0 - \sin 15^0 =$_____ [1996]
1)1/2 2)$1/\sqrt{2}$ 3) $\sqrt{3}/2$ 4) $\sqrt{2}$

51. If $x = a(\sec\theta + \tan\theta)^2$ and $y = b(\sec\theta - \tan\theta)^4$ then $x^4y^2 =$___ [1997]
1)a^2b^2 2)a^4b^4 3)a^4b^2 4)a^2b^4

52. $\dfrac{\sin(-660^0)\tan(1050^0)\sec(-420^0)}{\cos 225^0 \operatorname{cosec} 315^0 \cos 510^0} =$_____ [2000]
1)$1/\sqrt{3}$ 2)$2/\sqrt{3}$ 3) $\sqrt{3}/2$ 4) $\sqrt{3}$

53. If $(\sin\alpha + \operatorname{cosec}\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$ then k=____[2000]
1)4 2)6 3)7 4)8

54. $\left(\dfrac{\sqrt{3}+2\cos A}{1-2\sin A}\right)^{-3} + \left(\dfrac{1+2\sin A}{\sqrt{3}-2\cos A}\right)^{-3} =$_____ [2000]
1)1 2)2 3)0 4)4

55. If $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$ then $\cos\theta + \sin\theta =$ _____ (2001)
1)0 2)$\pm\sqrt{2}\cos\theta$ 3)$\pm\sqrt{2}\sin\theta$ 4)1

56. If $\tan\theta + \cot\theta = 2$, then $\sin\theta =$___ (2001)
1)±1/ 2)$1/\sqrt{2}$ 3)±1/3 4) none

57. $\sum_{k=1}^{3} \cos^2\left((2k-1)\pi/2\right) =$_____ (2002)
1)0 2)1/2 3)-1/2 4)3/2

58. $A+C=2B \Rightarrow \dfrac{\cos C - \cos A}{\sin A - \sin C} =$ _____ (2005)
1)cotB 2)cot2B 3)tan2B 4)tanB

59. $\sin 120^0 \cos 150^0 - \cos 240^0 \sin 330^0 =$___ (2006)
1)1 2)-1 3)2/3 4)- $[(\sqrt{3}+1)/4]$

60. $\operatorname{Cosec} 15^0 + \sec 15^0 =$ (2006)
1)$2\sqrt{2}$ 2)$\sqrt{6}$ 3)$2\sqrt{6}$ 4)$\sqrt{6}+\sqrt{2}$

61. If θ lies in the first quadrant and 5 tanθ = 4, then $\frac{5\sin\theta - 3\cos\theta}{\sin\theta + 2\cos\theta}$ = (2007)

1)5/14 2)3/14 3)1/14 4)0

62. $\frac{\tan 80^0 - \tan 10^0}{\tan 70^0}$ = (2007)

1)0 2)1 3)2 4)3

63. $\sqrt{2}\cos ec 20 \sec 20 =$ (2008)

1)0 2)1 3)2 4) $\frac{\sqrt{3}}{2}$

64. $a\sin^2\theta + b\cos^2\theta = c \Rightarrow \tan^2\theta =$ (2010)

1) $\frac{b-c}{a-c}$ 2) $\frac{c-b}{a-c}$ 3) $\frac{a-c}{b-c}$ 4) $\frac{a-c}{c-b}$

65. $\cos 36^0 - \cos 72^0 =$ (2012)

1) 1 2) 1/2 3) 1/4 4) 1/8

66. $\sin\theta + \cos\theta = p,\ \sin^3\theta + \cos^3\theta = q \Rightarrow p\left(p^2 - 3\right) =$ (2013)

1) q 2) 2q 3) – q 4) – 2q

67. If cosx = tany, coty = tanz & cotz = tanx; then sinx = (2014)

1) $\frac{\sqrt{5}-1}{4}$ 2) $\frac{\sqrt{5}+1}{2}$ 3) $\frac{\sqrt{5}-1}{2}$ 4) $\frac{\sqrt{5}+1}{4}$

68. In a ΔABC the value of $\angle A$ us obtained from the equation 3cosA + 2 = 0. The quadratic equation, whose roots are sinA & tanA is (2015)

1) $3x^2 + \sqrt{5x} - 5 = 0$ 2) $6x^2 - \sqrt{5x} - 5 = 0$

3) $6x^2 + \sqrt{5x} - 5 = 0$ 4) $6x^2 + \sqrt{5x} + 5 = 0$

69. If $\sin\theta + \cos\theta = p$ & $\tan\theta + \cot\theta = q$ then $q(p^2 - 1) =$ (2015, A.P)

1) $\frac{1}{2}$ 2) 2 3) 1 4) 3

70. If $\cos^3\theta + \cos^3\left(\frac{2\pi}{3} + \theta\right) + \cos^3\left(\frac{4\pi}{3} + \theta\right) = a\cos 3\theta, then\ a =$ (2016)

1) $\frac{1}{4}$ 2) $\frac{3}{4}$ 3) $\frac{5}{4}$ 4) $\frac{7}{4}$

71. $\frac{\cos 13^0 - \sin 13^0}{\cos 13^0 + \sin 13^0} + \frac{1}{\cot 148^0} =$ (2016)

1) 1 2) -1 3) 0 4) $\frac{1}{2}$

72. If cosx + cosy + cosα = 0 & sinx + siny + sinα = 0, then $\cot\left(\frac{x+y}{2}\right)=$ (2016)

1) sinα 2) cosα 3) tanα 4) cotα

73. If $(1+\tan\alpha)(1+\tan 4\alpha)=2, \alpha\in\left(0,\frac{\pi}{16}\right), then\ \alpha=$ (2016AP)

1) $\frac{\pi}{20}$ 2) $\frac{\pi}{30}$ 3) $\frac{\pi}{40}$ 4) $\frac{\pi}{60}$

KEY

1) 1	2) 2	3) 4	4) 4	5) 3	6) 4	7) 3	8) 3	9) 4	10) 3
11) 2	12) 3	13) 2	14) 4	15) 1	16) 2	17) 3	18) 4	19) 2	20) 2
21) 4	22) 1	23) 2	24) 1	25) 4	26) 2	27) 2	28) 3	29) 4	30) 4
31) 3	32) 2	33) 1	34) 4	35) 2	36) 1	37) 3	38) 2	39) 3	40) 2
41) 3	42) 2	43) 3	44) 3	45) 1	46) 2	47) 2	48) 1	49) 1	50) 1
51))2	52) 3	53) 2	54) 3	55) 3	56) 2	57) 2	58) 4	59) 4	60) 2
61) 1	62) 3	63) 4	64) 2	65) 2	66)	67)3	68)3	69)2	70) 2
71) 3	72) 4	73) 1							

Exercise-B

1. If x= tan θ +sin θ, y = tan θ - sin θ then $x^2-y^2=$

1) 1 2) $4\sqrt{xy}$ 3) $2\sqrt{xy}$ 4) $\sqrt{xy}$

2. Sin (A+B-C) = Cos (A-B+C) = tan (B+C-A) =1,find A, B and C.

1) 45^0, 22 ½ ^{0}, 67 1/2^0 2) 45^0, 67 1/2^0, 22 1/2^0

3) 45^0,90^0,30^0 4) 22 1/2^0,45^0,67 1/2^0

3. Tan π/24. Tan3π/24. Tan 5π/24. Tan 7π/24. Tan 9π/24. Tan 11π/24=

1) -1 2)1 3)0 4)2

4. If α+β =π/2 and β + γ =α then tanα =

1) 2[tanβ+tan γ] 2)[tanβ + tan γ]

3)tanβ + 2tan γ 4)2tanβ + tan γ

5. If A+B+C = π and Cos A = CosB CosC then the value of tanA interms of B and C is

1) tanB tanC 2)tanB + tanC

3)tanB-tanC 4)tanC –tanB

6. If $\tan A=\frac{x\sin B}{1-xCosB}$ and $\tan B=\frac{Y\sin A}{1-y\cos A}$ then $\frac{\sin A}{\sin B}=$

1) x/y 2)y/x 3)x+y 4)x-y

7. If $\alpha+\beta+\gamma=\prod/2$ and $\cot\alpha, \cot\beta, \cot\gamma$ are in A.P.Then the value of $\cot\alpha.\cot\gamma$ is
1) 1 2)2 3)3 4) 4

8. If $\cos x + \cos^2 x = 1$ then $\sin^{12} x + 3\sin^{10} x + 3\sin^8 x + \sin^6 x$
1) 0 2) –1 3) 1 4) 2

9. $1+\cos\theta + \cos^2\theta + \ldots\ldots\ldots \infty = 4 + 2\sqrt{3}$ $0 < \theta < 2\pi$ then find the values of θ …..
1) $\frac{\pi}{3}, \frac{2\pi}{3}$ 2) $\frac{\pi}{6}, \frac{5\pi}{6}$ 3) $\frac{\pi}{6}, \frac{11\pi}{6}$ 4) $\frac{\pi}{6}, \frac{7\pi}{6}$

10. A,B,C are angle of a traiangle ABC $Cos\left[\frac{3A+2B+C}{2}\right]+Cos\left[\frac{A-C}{2}\right]=$
1)0 2)1 3)cosA 4)cosC

11. If $\sin\theta=\left(\frac{a-4}{2}\right)$ then
1) $1 \le a \le 8$ 2) $0 \le a \le 2$
3) $2 \le a \le 6$ 4) $-2 \le a \le 2$

12. If $0<\theta<\frac{\pi}{2}$ & $2\sin\theta=\sqrt{3}\cos 10^0+\sin 10^0$ then $\theta=$
1) 70^0 2) 50^0 3) 60^0 4) 40^0

13. (1-sin A) (1-sinB) (1-sinC) = (1+sinA) (1+sinB) (1+sinC). Each is equal to
1) +cosA sin B sinC 2) $\pm$ cos A cos B cos C
3) $\pm$cos B sin A sinC 4) $\pm$sinA sin B sinC

14. If $\theta=\frac{\pi}{4}$ then $\frac{\sin 23\theta-\sin 7\theta}{\sin 2\theta+\sin 14\theta}=$
1) 1 2) -1 3) 0 4) 1/2

15. If $\tan^2\theta=1-k^2$ then $\sec\theta+\tan^2\theta\operatorname{cosec}\theta=$
1) $\sqrt{2-k^2}$ 2) $\sqrt{2+k^2}$ 3) $\left(2-k^2\right)^{3/2}$ 4) $\left(2+k^2\right)^{3/2}$

16. If sinA, cosA, tanA are in G.P. then $\cot^6 A - \cot^2 A =$
1) 1 2) – 1 3) 0 4) 2

17. If $x = y\cos\left(\frac{2\pi}{3}\right) = z\cos\left(\frac{4\pi}{3}\right)$ then xy + yz + zx =
1) 0 2) 1 3) – 1 4) 1/2

18. $3\left[\sin^4\left(\frac{3\pi}{2}-\alpha\right)+\sin^4(3\pi-\alpha)\right]-2\left[\sin^6\left(\frac{\pi}{2}+\alpha\right)+\sin^6(5\pi-\alpha)\right]=$

1) 1 2) 0 3) 3 4) 5

19. If $x = \cos 10^0 - \sin 10^0$ then
1) $x > 0$ 2) $x < 0$ 3) $x = 0$ 4) $x \geq 0$

20. In ΔABC, $5\cos A + 3 = 0$ then the quadratic equation whose roots are sinA & tanA is
1) $15x^2+32x+16=0$ 2) $15x^2+8x-16=0$
3) $15x^2-18x-16=0$ 4) $15x^2-8x-16=0$

KEY

1) 2	2) 2	3) 2	4) 3	5) 2	6) 1	7) 3	8) 3	9) 3	10) 1
11) 3	12) 1	13) 2	14) 2	15) 3	16) 1	17) 1	18) 1	19) 1	20) 2

AIEEE PROBLEMS

1. If $\tan\theta = -4/3$ then $\sin\theta =$ [2002]
1) –4/5 but not 4/5 2) –4/5 or 4/5 3) 4/5 but not –4/5
4) none

KEY

1) 2

7. COMPOUND ANGLES

1. Sin(A+B) =sinA cosB+cosA sinB
   Sin (A-B) =sinA cosB-cosA sinB

2. Cos (A+B) = Cos A CosB-SinA SinB
   Cos(A-B) = CosA CosB+SinA SinB

3. $Tan(A+B) = \dfrac{\tan A + \tan B}{1 - \tan A \tan B}$

   $Cot(A+B) = \dfrac{CotACotB - 1}{CotB + CotA}$

4. $Sin(A+B)Sin(A-B) = Sin^2 A - Sin^2 B = Cos^2 B - Cos^2 A$

   $Cos(A+B)Cos(A-B) = Cos^2 A - Sin^2 B = Cos^2 B - Sin^2 A$

5. $Tan(A+B)Tan(A-B) = \dfrac{Tan^2 A - Tan^2 B}{1 - Tan^2 A \quad Tan^2 B}$

6. $Cot(A+B)Cot(A-B) = \dfrac{Cot^2 ACot^2 B - 1}{Cot^2 B - Cot^2 A}$

7. $\tan(45+\theta) = \dfrac{1+\tan\theta}{1-\tan\theta} = \dfrac{Cos\,\theta + Sin\,\theta}{Cos\,\theta - Sin\,\theta}$

8. $\tan(45-\theta) = \dfrac{1-\tan\theta}{1+\tan\theta} = \dfrac{Cos\,\theta - Sin\,\theta}{Cos\,\theta + Sin\,\theta}$

9. $Cot\theta - \tan\theta = 2\cot 2\theta$

10. If $A + B = 45^0 \, or \; 225^0 \; then (1+\tan A)(1+\tan B) = 2(CotA - 1)(CotB - 1) = 2$

11. If $A + B = 135^0 \, then (1+CotA)(1+CotB) = 2(1-TanA)(1-TanB) = 2$

12. If $\alpha+\beta=\pi/2$ then $\sin^2\alpha$ $+\sin^2\beta$ =1, $\cos^2\alpha+\cos^2\beta$ =1, $\tan\alpha$ .Tan β =1, $\cot\alpha$ .cot β =1

13. If $\alpha+\beta=\pi$ then $\cos\alpha+\cos\beta$ =0, $\sin\alpha=\sin\beta$, $\tan\alpha$+.Tan β =0, $\sin^2\alpha$ + $\cos^2\beta$ =1, $\cos^2\alpha+\sin^2\beta$ =1

14. If $\alpha+\beta=3\pi/2$ then $\sin^2\alpha$ $+\sin^2\beta$ =1, $\cos^2\alpha+\cos^2\beta$ =1, $\tan\alpha$ .Tan β =1, $\cot\alpha\cot\beta$ =1

15. If $\alpha+\beta=2\pi$ then $\sin\alpha$ $+\sin\beta$ =0, $\cos\alpha$ =$\cos\beta$, $\tan\alpha+\tan\beta$ =0

Exercise-A

1. A,B,C are angle of a triangle ABC $Cos\left[\frac{3A+2B+C}{2}\right]+Cos\left[\frac{A-C}{2}\right]=$

   1)0 2)1 3)cosA 4)cosC

2. $\frac{\cot\theta+\cos ec\theta-1}{\cot\theta-\cos ec\theta+1}=$

   1) $\frac{1-\cos\theta}{\sin\theta}$ 2) $\frac{\sin\theta}{1+\cos\theta}$ 3) $\frac{1+\cos\theta}{\sin\theta}$ 4) $\frac{1-\sin\theta}{\cos\theta}$

3. $Sin^2(51^0-x)+Sin^2(39^0+x)=$

   1)-1 2)0 3)1 4)2

4. $Cot\frac{\pi}{20}.Cot\frac{3\pi}{20}Cot\frac{5\pi}{20}.Cot\frac{7\pi}{20}Cot\frac{9\pi}{20}Cot\frac{11\pi}{20}=$

   1)1 2)-1 3)√3 4)-√3

5. $Cos^2 48^0-Sin^2 12^0$

   1) $\frac{\sqrt{5}+1}{2}$ 2) $\frac{\sqrt{5}+1}{8}$ 3) $\frac{\sqrt{5}-1}{8}$ 4) $\frac{\sqrt{5}-1}{2}$

6. $Sin^2 52\frac{1}{2}-Sin^2 22\frac{1}{2}=$

   1) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ 2) $\frac{\sqrt{3}-1}{2\sqrt{2}}$ 3) $\frac{\sqrt{3}+1}{4\sqrt{2}}$ 4) $\frac{\sqrt{3}-1}{4\sqrt{2}}$

7. $\tan 54^0=$

   1) $\frac{Sin9+\cos 9}{Sin9-\cos 9}$ 2) $\frac{Sin9-\cos 9}{Sin9-\cos 9}$ 3) $\frac{Cos9+Sin9}{Cos9-Sin9}$ 4) $\frac{Cos9-Sin9}{Cos9-Sin9}$

8. (sec A+ tan A) (sec B – tan B) (sec C + tan C) = (sec A – tan A) (sec B – tan B) (sec C – tan C) each is equal to

   1) ± 1 2) 0 3) 2 4)4

9. $\tan\frac{\pi}{24}.\tan\frac{3\pi}{24}\tan\frac{5\pi}{24}.\tan\frac{7\pi}{24}\tan\frac{9\pi}{24}\tan\frac{11\pi}{24}=$

   1)-1 2)1 3)0 4)2

10. $Sin^2(51^0-x)+Sin^2(39^0+x)=$

    1)-1 2)0 3)1 4)2

11. If 'k' is a positive integer the $\sin(\alpha+\pi)+\sin(\alpha+2\pi)+\ldots+\sin(\alpha+2k\pi)$

1)-1 2)0 3)1 4)k

12. $\sin^2 \pi/18 + \sin^2 \pi/9 + \sin^2 7\pi/18 + \sin^2 4\pi/9 =$
1)0 2)-1 3)1 4)2

13. If $\tan(\alpha+\beta)=3$, $\tan(\alpha-\beta)=1$ then $\tan 6\beta =$
1)0 2)-1 3)1 4)2

14. $(Sin\ x + Cos\ x)^4 + 6(Sinx + Cosx)^2 + 4(Sin^6 x + Cos^6 x) =$

1)1 2)2 3)3 4)4

15. If $\sin\theta + \operatorname{cosec}\theta = 3$ then $\sin^2\theta + \operatorname{cosec}^2\theta =$
1)5 2)7 3)9 4)11

16. Match the following:

I. $\sin 15^0 \cos 15^0$	a)$\sqrt{2}-1$
II. $\tan 15^0$	b)$-2\sqrt{3}$
III. $\tan 22\frac{1}{2}^0$	c)1/4
IV. $\tan 15^0 - \cot 15^0$	d)$2-\sqrt{3}$

1)d,a,b,c 2)a,b,c,d 3)b,c,d,a 4)c,d,a,b

17. A : $\cos 20^0 + \cos 100^0 + \cos 140^0 = 0$.
R : $\cos\theta + \cos(120^0 - \theta) + \cos(120^0 + \theta) = 0$
1)A is true, R is true and R is correct explanation of A
2)A is true, R is true and R is not correct explanation of A
3)A is true, R is false
4)A is false, R is true

18. $\tan 100^0 + 2\tan 70^0 =$
1)$\tan 10^0$ 2)$\cot 10^0$ 3)$-\tan 10^0$ 4)$-\cot 10^0$

19. $\tan\theta + \cot\theta = 3 \Rightarrow \tan^4\theta + \cot^4\theta =$
1)47 2)162 3)24 4)48

20. If $\alpha+\beta = \pi/2$ and $\beta + \gamma = \alpha$ then $\tan\alpha =$
1)$2[\tan\beta + \tan\gamma]$ 2)$[\tan\beta + \tan\gamma]$ 3)$\tan\beta + 2\tan\gamma$ 4)$2\tan\beta + \tan\gamma$

21. If $A+B+C = \pi$ and $\cos A = \cos B \cos C$ then the value of $\tan A$ interms of B and C is
1)$\tan B \tan C$ 2)$\tan B + \tan C$ 3)$\tan B - \tan C$ 4)$\tan C - \tan B$

22. If $\tan B = \frac{2\sin A Sin C}{\sin(A+C)}$ then tanA, t anB, tanC are in

1)A.P 2)G.P 3)H.P 4)A.G.P

23. If $\tan A = \frac{x\sin B}{1-xCosB}$ and $\tan B = \frac{Y\sin A}{1-y\cos A}$ then $\frac{\sin A}{\sin B} =$

1)x/y 2)y/x 3)x+y 4)x-y

24. If $\alpha+\beta+\gamma = \Pi/2$ and $\cot\alpha, \cot\beta, \cot\gamma$ are in A.P then the value of $\cot\alpha.\cot\gamma$ is

1)1 2)2 3)3 4) 4

25. $\text{Sin}\,\alpha = \frac{2xy}{x^2+y^2} \Rightarrow \text{Sec}\,\alpha - \tan\alpha =$

1) $\frac{x-y}{x+y}$ 2) $\frac{x+y}{x-y}$ 3) $\frac{xy}{x^2+y^2}$ 4) $\frac{xy}{x+y}$

26. $\tan(45^0+A) - \tan(45^0-A) =$_____

1) tan2A 2) 2 tan 2A 3) 2 tan A 4) tanA

27. $\tan 15^0 + \tan 30^0 + \tan 15^0 \tan 30^0 =$_____

1) 1 2)-1 3) 0 4) $\Pi/4$

28. $\tan 20^0 + \tan 40^0 + \sqrt{3}\tan 20^0 \tan 40^0 =$_____

1) 1 2) $1/\sqrt{3}$ 3) $\sqrt{3}$ 4) -1

PREVIOUS EAMCET PROBLEMS

29. If $\tan 35^0 = k$ *then* $\frac{\tan 145^0 - \tan 125^0}{1+\tan 145^0 \tan 125^0} =$

1)$(1-k^2)/2k$ 2)$2k/(1-k^2)$ 3)$(1+k^2)/2k$ 4)$2k/(1+k^2)$

30. If $\frac{CosA}{CosB} = n$ *and* $\frac{SinA}{SinB} = m$ then $(m^2-n^2)Sin^2B =$ [2000]

1)n^2 2)$1+n^2$ 3)n^2-1 4)$1-n^2$

31. If $Cos6 \;\; Sin2 \;\; 4Cos \;\; 72 =$ [2000]

1)1/2 2)1/8 3)1/4 4)3/4

32. If $\tan\theta_1 = k\cot\theta_2$ then $\frac{\cos(\theta_1-\theta_2)}{\cos(\theta_1+\theta_2)} =$_____ [2000]

1)(k+1)/(k-1) 2)(k-1)/(k+1) 3)(1-k)/(1+k) 4)(1+k)/(1-k)

33. If A,B,C,D is a cyclic quadrilateral then Cos A+ Cos B + cos C + cos D =[2001]
1)1 2)2 3)3 4)0

34. $\cos^2(\Pi/6+\theta) - \sin^2(\Pi/6-\theta)$=_____ [2001]
1)cosθ 2)1/2cos2θ 3)3 4)2cosec2θ

35. If cos(α+β)=4/5, sin(α-β)=5/13 and α, β lie between 0 and π/4, then tan2α=
1)56/33 2)33/56 3)16/65 4)60/61 [2002]

36. cos α sin (β-γ) + cos β sin (γ -α) + cos γ sin (α-β) = [1996,2003]
1) 1 2)2 3) 3 4) 0

37. In a ΔABC, $Cos\left(\frac{B+2C+3A}{2}\right)+Cos\left(\frac{A-B}{2}\right)$ (2004)
1)-1 2)0 3)1 4)2

38. If cos(A-B) =3/5 and tan A tan B = 2 then which one of the following is true? (2007)
1)sin(A +B)= 1/5 2)sin(A +B)=-1/5
3)cos(A -B)=1/5 4)cos(A +B) =-1/5

39. tan 75°-tan30°-tan75°.tan30° = (2007)
1)0 2)1 3)2 4)3

40. If A=35^0 ,B=15^0 and C=40^0 then $\tan A\tan B+\tan B\tan C+\tan C\tan A=$ (2008)
1)0 2)1 3)2 4)3

41. If $\cos ec\theta-\cot\theta=2017$, then quadrant in which θ lies is (2017)
1) I 2) II 3) III 4) II

KEY

1) **1**	2)	3) **3**	4) **2**	5) **2**	6) **3**	7) **3**	8) **1**	9) **2**	10) **3**
11) **2**	12) **1**	13) **4**	14) **1**	15) **2**	16) **4**	17) **1**	18) **3**	19) **1**	20) **3**
21) **2**	22) **3**	23) **1**	24) **3**	25) **1**	26) **2**	27) **2**	28) **1**	29) **3**	30) **1**
31) **4**	32) **1**	33) **2**	34) **2**	35) **1**	36) **4**	37) **2**	38) **4**	39) **1**	40)**2**
41) **4**	42)	43)	44)	45)	46)	47)	48)	49)	

AIEEE PROBLEMS

If sin (α+β) = 1, sin (α-β) = ½ then tan (α+2β) tan (2α+β) = [2002]
1) 1 2) –1 3) 0 4) none

KEY

1) **1**

Exercise-B

1. If tan θ= b/a, then $\frac{a\cos\theta+b\sin\theta}{a\cos\theta-b\sin\theta}$ =
   1)a+b/a-b 2)a-b/a+b 3)a^2+b^2/a^2-b^2 4)a^2-b^2/a^2+b^2

2. $\frac{\cos A}{1-\tan A}$ + $\frac{\sin A}{1-\cot A}$ =
   1)cosA+sinA 2)cosA-sinA 3)sinA-cosA 4)sinAcosA

3. If secA=x+1/4x, then secA+tanA=
   1)x 2)2x 3)2/x 4)x/2

4. If secA+tanA=4,then sin A =
   1)17/8 2)15/8 3)8/17 4)15/17

5. If cosA+sinA=√2 cosA, then cos A-sinA=
   1) √2sin A 2)2sinA 3)1/√2sinA 4)1./2sinA

6. $\sin^2 A\cos^2 B+\cos^2 A\sin^2 B+\sin^2 A\sin^2 B+\cos^2 A\cos^2 B$=
   1)-1 2)0 3)1 4)2

7. $\frac{\tan A}{1+\sec A}$ + $\frac{1+\sec A}{\tan A}$ =
   1)2sinA 2)2cosA 3)2secA 4)2cosecA

8. If sinA=3/5 and A lies in thesecond quadrant,then tanA-secA/cotA+cosecA=
   1)-2/3 2)-3/2 3)2/3 4)3/2

9. If tan A+sinA=p and tanA-sinA=q, then p^2-q^2=
   1)4tanA 2)4sinA 3)4tanAsinA 4)tanAsinA

10. If secθ=29/20 and θ lies in the first quadrant, then secθ-tanθ=
    1)2/5 2)5/2 3)2/3 4)3/2

11. If secθ= -13/12 and θ lies in the third quadrant, then cotθ=
    1)5/12 2)12/5 3)5/13 4)13/5

12. $\frac{1+\tan^2\theta}{1+\cot^2\theta}$ =
    1)1-tanθ/1-cotθ 2)1-cotθ/1-tanθ
    3)$(1+\tan\theta/1+\cot\theta)^2$ 4)$(1+\cot\theta/a+\tan\theta)^2$

13. If tan θ=4/5, then 3cosθ+2sinθ/4cosθ+3sinθ =
    1)23/32 2)32/23 3)21/31 4)31/21

14. If A is the right angle in the triangle ABC, then tan B+tanC=
1)a+b/c 2)c^2/ab 3)a^2/bc 4)b^2/qc

15. $1+\frac{1+\cos\theta}{\sin\theta}-\frac{\sin^2\theta}{1+\cos\theta}-\frac{\sin\theta}{1-\cos\theta}=$
1)-sinθ 2)sinθ 3)-cosθ 4)cosθ

16. $2(\cos^6 A+\sin^6 A)-3(\cos^4 A+\sin^4 A)=$
1)-4 2)-1 3)1 4)4

17. $(\tan A+\tan B)^2+(1-\tan A\tan B)^2=$
1)$\sec^2 A+\sec^2 B$ 2)$\cos^2 A+\cos^2 B$ 3)$\sec^2 A\sec^2 B$ 4)$\cos^2 A\cos^2 B$

18. C is an obtuse angle in the Δ ABC, If sin (A+B)=√3/2 and cos(A-B)=1/√2, then A=
1)52 ½ ^{0} 2)7 ½^0 3)60^0 4)30^0

19. $\frac{\cos(90^0+A)\sec(-A)\tan(180^0-A)}{\sec(360^0-A)\sec(180^0+A)\cot(90^0-A)}=$
1)-1 2)0 3)1 4)None

20. If $\sin(270^0+\theta)=\operatorname{cosec}(270^0-\theta)+x\cos(180^0+\theta)\tan(180^0-\theta)$, then x=
1)sinθ 2)cosθ 3)tanθ 4)cotθ

21. $\tan 12^0 \tan 36^0 \tan 45^0 \tan 54^0 \tan 78^0=$
1)-2 2)-1 3)0 4)1

22. $\cos 24^0+\cos 55^0+\cos 125^0+\cos 204^0+\cos 300^0=$
1)-1/2 2)-1 3)1/2 4)1

23. If α andβ are acute angles such that cosα =13/14 and cosβ=1/7, then(α-β)=
1)30^0 2)45^0 3)60^0 4)90^0

24. θ and ϕ are acute angles such that sin θ=1/√5 and sinϕ=1/√10.Then θ+ϕ=
1)30^0 2)45^0 3)60^0 4)90^0

25. $\frac{\cos 23^0-\sin 23^0}{\cos 23^0+\sin 23^0}=$
1)$\tan 22^0$ 2)$\cot 22^0$ 3)$\tan 23^0$ 4)$\cot 23^0$

26. A and B lie in the third quadrant and cosA = -7/25 and sinB=-5/13. Then cos(A+B)=
1)-36/125 2)36/125 3)-36/325 4)36/325

27. cos[(p+1) θ] cos[(p-1) θ] +sin[(p+1) θ]sin [(p-1) θ]=
1)cosp θ 2)sinp θ 3)cos2 θ 4)sin2 θ

28. tan 2A-tanA=

1)tanA 2)sec2A 3)secAtan2A 4)tanAsec2A

29. $\frac{\sin A}{1-\cot A} + \frac{\cos A}{1-\tan A} =$

1)2sin(π/4+A) 2)√2 sin(π/4+A) 3)2cos(π/4+A)4) √2 sin(π/4+A)

30. $\tan 70^0 =$

1)$\tan 20^0 + 2\tan 50^0$ 2)$2\tan 20^0 + \tan 50^0$ 3)$\tan 20^0 + \tan 50^0$ 4)$2(\tan 20^0 + \tan 50^0)$

KEY

1) **3**	2) **1**	3) **2**	4) **4**	5) **1**	6) **3**	7) **4**	8) **4**	9) **3**	10) **1**
11) **2**	12) **3**	13) **1**	14) **3**	15) **4**	16) **2**	17) **3**	18) **1**	19) **4**	20) **3**
21) **4**	22) **3**	23) **3**	24) **2**	25) **1**	26) **3**	27) **3**	28) **4**	29) **2**	30) **1**

8. MULTIPLE AND SUB-MULTIPLE ANGLES

1. $Sin2\theta = 2Sin\theta Cos\theta = \dfrac{2\tan\theta}{1+\tan^2\theta}$

2. $Cos2\theta = Cos^2\theta = 1 - 2Sin^2\theta = 2Cos^2\theta - 1 = \dfrac{1-\tan^2\theta}{1+\tan^2\theta}$

3. $Cos^2\theta = \dfrac{1+Cos2\theta}{2}, Sin^2\theta = \dfrac{1-Cos2\theta}{2}$

4. $Tan2\theta = \dfrac{2\tan\theta}{1-\tan^2\theta}$

5. $Tan\theta = \pm\sqrt{\dfrac{(1-Cos2\theta)}{(1+Cos2\theta)}}$

   $Cot\theta = \pm\sqrt{\dfrac{(1+Cos2\theta)}{(1-Cos2\theta)}}$

6. $Sin3\theta = 3Sin\theta - 4Sin^3\theta$

7. $Cos3\theta = 4Cos^3\theta - 3Cos\theta$

8. $Tan3\theta = \dfrac{3\tan\theta - \tan^3\theta}{1-3\tan^2\theta}$

9. $Cot3\theta = \dfrac{3Cot\theta - Cot^3\theta}{1-3Cot^2\theta}$

10. If A+B+C = 180^0 then
    Σtan2A $= \pi$ (tan2A)
    Σ tan3A = ∏(tan3A)
    Σ cot A cot B =1
    Σ tan A/2 tan B/2 =1
    Σ cot A/2 = ∏ (cot A/2)

11. sin A sin (60-A) sin (60+A) = $\dfrac{1}{4}Sin3A$

12. cos A cos (60-A) cos (60+A) = $\dfrac{1}{4}Cos3A$

13. tan A tan (60-A) tan (60+A) = tan 3A

14. cot A cot (60-A) cot (60-A) =cot3A

15. secAsec(60-A)sec(60+A)=4sec3A

16. cosecAcosec(60-A)cosec(60+A)=4cosec3A

17. cos A + cos (120^0 +A) +cos (120-A) =0

18. tanA + tan (A-60) + tan (A+60) =3 tan 3A

19. tan A+tan (60+A) tan (120+A) =3 tan 3A
tanA+tan (120+A) +tan (240+A) =3tan 3A
tanA+tan (240+A) + tan(300+A) =3 tan 3A
tan A+tan (300+A) + tan (60+A) =3 tan 3A

20. cotA+cot (A-60) +cot(A+60) = 3cot3A
Cot A + cot (120 +A) + cot (240 +A) = 3 cot 3A
It is also applicable if we take 120^0, 240^0 or 300^0 in place of 60^0

21. Cot A + cot (60+A) +cot (120+A) = 3 cot 3A
Cot A + cot (120 +A) + cot (240 +A) = 3 cot3A
Cot A+cot (240+A) +cot (300+A) =3 cot 3A

22. Cot A +tan A=2cosec 2A
Cot A – tan A = 2 cot 2A

23. Sin^2 A+ $\sin^2$ (60-A) + $\sin^2$ (60+A) = $\frac{3}{2}$

24. Cos^2 A+ $\cos^2$ (60-A) + $\sin^2$ (60-A) = $\frac{3}{2}$

25. Sin^3 A+$\sin^3$(60-A) – $\sin^3$(60+A) = $-\frac{3}{4}Sin3A$

Sin^3 A- Sin^3(120^0-A)+$\sin^3$ (120^0+A) = $-\frac{3}{4}Sin3A$

Sin^3 A- Sin^3(240^0-A)+$\sin^3$ (240^0+A) = $-\frac{3}{4}Sin3A$

Sin^3 A- Sin^3(300^0-A)-$\sin^3$ (300^0+A) = $-\frac{3}{4}Sin3A$

26. Cos^3 θ - $\cos^3$ (60^0-θ) – $\cos^3$ (60+θ) = $\frac{3}{4}Cos3\theta$

Cos^3 θ + $\cos^3$ (120^0-θ) + $\cos^3$ (120^0+θ) = $\frac{3}{4}Cos3\theta$

$\text{Cos}^3\,\theta + \cos^3(240^0-\theta) + \cos^3(240+\theta) = \frac{3}{4}Cos3\theta$

$\text{Cos}^3\theta - \cos^3(300^0-\theta) - \cos^3(300^0+\theta) = \frac{3}{4}Cos3\theta$

27. $\sin^3\theta - \sin^3(60^0+\theta) + \sin^3(120+\theta) = -\frac{3}{4}Sin3\theta$

$\sin^3\theta + \sin^3(120^0+\theta) + \sin^3(240^0+\theta) = -\frac{3}{4}Sin3\theta$

$\sin^3\theta + \sin^3(240^0+\theta) - \sin^3(300^0+\theta) = -\frac{3}{4}Sin3\theta$

$\sin^3\theta - \sin^3(60+\theta) - \sin^3(300^0+\theta) = -\frac{3}{4}Sin3\theta$

28. $\text{Cos}^3\,\theta - \cos^3(60^0+\theta) + \cos^3(120^0+\theta) = \frac{3}{4}Cos3\theta$

$\text{Cos}^3\,\theta + \cos^3(120^0+\theta) + \cos^3(240^0+\theta) = \frac{3}{4}Cos3\theta$

$\text{Cos}^3\,\theta + \cos^3(240^0-\theta) - \cos^3(300^0+\theta) = \frac{3}{4}Cos3\theta$

$\text{Cos}^3\,\theta - \cos^3(60^0+\theta) - \cos^3(300^0+\theta) = \frac{3}{4}Cos3\theta$

29. $Sin\ \ 22\frac{1}{2} = \sqrt{\frac{2-1}{2\sqrt{2}}}$

30. $Cos\ \ 22\frac{1}{2} = \sqrt{\frac{2+1`}{2\sqrt{2}}}$

31. $Tan\ \ 22\frac{1}{2} = \sqrt{2}-1,\ Tan\ \ 7\frac{1}{2}^{0} = \sqrt{6}-\sqrt{4}-\sqrt{3}+\sqrt{2}$

32. $Tan\ \ 22\frac{1}{2} = \sqrt{2}+1$

33. $\text{Cos}\,\alpha - \cos(60-\alpha) - \cos(60+\alpha) = 0$
$\text{Cos}\,\alpha + \cos(120-\alpha) + \cos(120+\alpha) = 0$
$\text{Cos}\,\alpha + \cos(240-\alpha) + \cos(240+\alpha) = 0$
$\text{Cos}\,\alpha + \cos(300-\alpha) - \cos(300+\alpha) = 0$

34. $\sin\alpha + \sin(60-\alpha) - \sin(60+\alpha) = 0$
$\sin\alpha - \sin(120-\alpha) + \sin(120+\alpha) = 0$

sin α-sin (240-α) +sin (240+α)=0
sin α+ sin (300-α) – sin (300 +α)=0

35. Let s = sinA/2,C=cosC/2

$$Sin\frac{A}{2}+Cos\frac{A}{2}=\pm\sqrt{1+SinA}$$

$$Sin\frac{A}{2}-Cos\frac{A}{2}=\pm\sqrt{1-SinA}$$

$$2Sin\frac{A}{2}=\pm\sqrt{1-SinA}\pm\sqrt{1-SinA}$$

$$2Cos\frac{A}{2}=\pm\sqrt{1+SinA}\pm\sqrt{1-SinA}$$

36. If S+C>0,S-C>0Then A/2 lies between π/4 and 3π/4
If S+C<0,S-C<0Then A/2 lies between 5π/4 and 7π/4
If S+C>0,S-C<0Then A/2 lies between -π/4 and π/4
If S+C<0,S-C>0Then A/2 lies between 3π/4 and 5π/4

Exercise-A

1. sin π/9 sin 2π/9 sin3π/9 sin 4π/9=_____
1)1/16 2) 2/16 3) 3/16 4) 1/12

2. sin 23^0 sin 37^0 sin 83^0=_____
1)$\frac{1}{4}$ cos 21^0 2) cos 21^0 3) sec 21^0 4) $\frac{1}{4}$ sec 21^0

3. sin 10^0 sin 30^0 sin 50^0 sin 70^0=_____
1)1/16 2) 2/16 3) 3/16 4) 4/16

4. sin 10^0 sin 50^0 sin 70^0 =_____
1)1/2 2) 1/4 3) 1/6 4) 1/8

5. cos 5^0 cos 55^0 cos 65^0 =_____
1)(√3+1) /2 √2 2) (√3-1) / 2 √2 3) (√3+1) / 8√2 4) (√3-1) /8√2

6. cos π/9 cos 2π/9 cos 3π/9 cos 4π/9 =_____
1) 1/16 2)1/4 n 3) 18 4) 1/12

7. tan 10^0 tan 50^0 tan 70^0=_____
1) √3 2) 1/ √3 3) √3/2 4) -√3

8. cot 5^0 cot 55^0 cot 65^0 =
1)2√3 2) 2-√3 3) 2+√3 4) √3

9. $\cot 20^0 \cot 40^0 \cot 60^0 \cot 80^0$=_____
1)3 2) 1/3 3) 1/√3 4) √3

[cos A + Cos (120-A) + cos (120+A) =0]

10. $\cos 85^0 + \cos 155^0 + \cos 35^0$=_____
1) 1 2)2 3)3 4) 0

11. $\cos 20^0 + \cos 100^0 + \cos 140^0$=_____
[$\cos^2 A + \cos^2 (120-A) + \cos^2 (120+A) = 3/2$]
1)1 2) 0 3)4 4) 2

12. $\cos^2 20^0 + \cos^2 100^0 + \cos^2 140^0$ =_____
1) 1/2 2) 2 3)3/2 4) 3/4

$$\left[\sqrt{2+\sqrt{2+\sqrt{2+2\cos\theta}}}\ ....n\ \ times = 2Cos\left(\frac{\theta}{2^n}\right)\right]$$

13. $\sqrt{2+\sqrt{2+\sqrt{2+2\cos\theta}}}$ =

1) 2cos (θ/2) 2) 2cos (θ/4) 3) 2 Cos (θ/6) 4) 2 Cos (θ/8)

14. $\sqrt{2+\sqrt{2+\sqrt{2+2\cos 240^0}}}$ =
1) √3 2) 1/√3 3) -√3 4) -1/√3

15. $\dfrac{2}{\sqrt{2+\sqrt{2+\sqrt{2+2Cos8\theta}}}}$ =
1)Cos θ 2) Sec θ 3) – Sec θ 4) Tan θ

16. $\sqrt{3}\ \text{cosec}\ 20^0 - \sec 20^0$ =
1) 4 2)2 3)-2 4) $\frac{1}{4}$

17. tan α + 2 tan 2α + 4 tan 4 α+ 8 cot8α=
[tanα = cotα-2cot2α]
1) sinα 2)cosα 3)tanα 4)cotα

18. sin π/14 sin 3π/14 sin 5π/14 ….. sin 13π/14 =
1)$\text{Cot}^2\ \alpha$ 2) $\text{Tan}^2\ \alpha$ 3) cot α 4)$\sin^2 \pi/14 \sin^2 3\pi/14 \sin^2 5\pi/14$

19. $\dfrac{Cos\ \ 3\theta}{2\ \ Cos2\theta - 1}$ =

1) $\sec\theta$ 2) $\operatorname{cosec}\theta$ 3) $\tan\theta$ 4) $\cos\theta$

20. If $x^2 + y^2 = 1$ then $(3x-4x^3)^2 + (3y-4y3^3)^2 =$
1) 1 2)2 3)-2 4)-1

21. If $\tan(45^0 + \theta) + \tan(45-\theta) = k \sec 2\theta$ then k=_____
1)1 2)2 3)3 4)-2

22. $\tan 2\alpha - \tan\alpha\,(1+\sec 2\alpha) =$_____
1) 1 2)-1 3)0 4) ∞

[$\cos\alpha + \cos(240 - \alpha) + \cos(240+\alpha)=0$]
[$\cos\alpha - \cos(300-\alpha) - \cos(300+\alpha)=0$]
[$\cos\alpha - \cos(60-\alpha) - \cos(60+\alpha)=0$]

23. $\cos 18 + \cos 222^0 + \cos 258^0 =$ _____
1)1 2) $-\infty$ 3) ∞ 4) 0

24. $\cos 10^0 - \sin 20^0 - \cos 50^0$
1)1 2) 0 3)-1 4)2

25. $\sin 20^0 + \sin 40^0 - \sin 80^0 =$_____
1)1 2)2 3)3 4) 0

26. $\sin 70^0 - \sin 50^0 - \sin 10^0$=_____
1) 0 2) 3 3) 2 4)1

27. $\sin 20^0 - \sin 100^0 + \sin 140^0$=_____
1) 1 2)2 3) 0 4)-2

28. $\sin 40^0 - \sin 200^0 + \sin 280^0$=_____
1) -2 2) -4 3)-1 4)0

29. If $\cot(\alpha+\beta) = 0$, $\sin(\alpha+2\beta)$=_____
1) $\sin\alpha$ 2) $\cos\alpha$ 3) $\tan\alpha$ 4) $\sin\beta$

30. $$\frac{1-Sin^2\theta}{1+Cos\theta} + \frac{1+Cos\theta}{Sin\theta} - \frac{Sin\theta}{1-Cos\theta} =$$
1)$\cos\theta$ 2)-$\cos\theta$ 3)$\sin\theta$ 4)$\tan\theta$

31. If $2\cos A/2 = \sqrt{1+\sin A} + \sqrt{1-\sin A}$ then A/2 lies between
1)$\pi/4$ and $\pi/8$ 2)-$\pi/4$ and $\pi/4$ 3) -$\pi/2$ and $\pi/2$ 4) -$\pi/4$ and $\pi/2$

32. If 2 sinA/2=$\sqrt{1+\sin A}$ + $\sqrt{1-\sin A}$ then A/2 lies between
1)π/4 and π/8 2)-π/4 and π/4 3) π/4 and 3π/4 4) -3π/4 and 3π/4

33. If 2 cosA/2=$\sqrt{1+\sin A}$ - $\sqrt{1-\sin A}$ then A/2 lies between
1)π/4 and π/8 2)-π/4 and π/4 3) -3π/2 and π/2 4) π/4 and 3π/4

34 $\tan A = \dfrac{1-\cos B}{\sin B} \Rightarrow \tan 2A - \tan B =$
1)0 2)1 3)1/2 4)1/4

35. $\dfrac{SinA + \sin 3A + \sin 5A + \sin 7A}{CosA + Cos3A + Cos5A + Cos7A}$ =tan x ⇒ x =
1)4A 2)3A 3)2A 4)A

36. $2\sin^2\beta + 4\cos(\alpha+\beta)\sin\alpha\sin\beta + \cos(\alpha+\beta) =$
1)sin2α 2)cos2α 3)tan2α 4)cot2α

37. tanB +cotB = 2Sec (2A) ⇒A+B =
1)∏/2 2)∏/3 3)∏/6 4)∏/4

38. $\begin{vmatrix} \sin^2 13^0 & \sin^2 77^0 & \tan 135^0 \\ \sin^2 77^0 & \tan 135^0 & \sin^2 13^0 \\ \tan 135^0 & \sin^2 13^0 & \sin^2 77^0 \end{vmatrix} =$
1)1 2)-1 3)0 4)2

39. A: $\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2}}}}$ = 2cos[π/32]
R: $\sqrt{2+\sqrt{2+\sqrt{2+.....nterms}}}$ = 2cos[π/2^n].
1)A is true, R is true . R is corrct explanation of A.
2)A is true, R is true, R is not correct explanation of A.
3)A is true, R is false.
4)A is false, R is true.

40. If tanβ = 2sinα sinγ cosec [α+γ], then cotα,cotβ,cotγ are in
1)A.P 2)G.P 3)H.P 4)A.G.P

41. cosα = $\dfrac{2\cos\beta - 1}{2-\cos\beta}$ (0<α,β<∏),α+β=∏, then tan α/2 =
1)$3^{1/4}$ 2)$3^{1/2}$ 3)3 4)3^2

42. If $\frac{x}{\tan(\theta+\alpha)}=\frac{y}{\tan(\theta+\beta)}=\frac{z}{\tan(\theta+\gamma)}$ then $\sum\frac{x+y}{x-y}\sin^2[\alpha-\beta]$=-----

1)1 2)-1 3)0 4)1/2

43. $4\cos6^0\cos42^0\cos60^0\cos66^0\cos78^0$

1)1/32 2)1/16 3)1/8 4)1/4

44. $\sin^4\pi/8+\sin^4 3\pi/8+\sin^4 5\pi/8+\sin^4 7\pi/8=$

1)1/2 2)1/4 3)3/2 4)3/4

45. $\cos^4\pi/8+\cos^4 3\pi/8+\cos^4 5\pi/8+\cos^4 7\pi/8=$

1)1/2 2)3/2 3)1/4 4)3/4

46. I: $\cos\theta+\cos(120^0-\theta)+\cos(120^0+\theta)=0$

II: $\tan\theta$ and $\sin2\theta$ always agree in both positive signs or both negative signs.

Which of the above statements is correct?

1)onlyI 2)onlyII 3)Both I&II 4)Neither I nor II

47. If $\cos(\theta-\alpha)$, $\cos\theta$, $\cos(\theta+\alpha)$ are in H.P then $\cos\theta\sec\alpha/2$ =

1) $\pm\frac{1}{\sqrt{2}}$ 2) $\pm\sqrt{2}$ 3) ±1 4) $\pm\frac{1}{2}$

48. A: $\tan\theta+2\tan2\theta+4\tan4\theta+8\tan8\theta-16\cot6\theta=\cot\theta$

R: $\cot\alpha-\tan\alpha=2\cot2\alpha$

1)A is true, R is true and R is correct explanation of A

2)A is true, R is true and R is not correct explanation of A

3)A is true , R is false 4)A is false, R is true

PREVIOUS EAMCET PROBLEMS

49. If $\sin 18^0=\frac{\sqrt{5}-1}{4}$ then $\sin 81^0$ =_____ (1990)

1) $\sqrt{(4+\sqrt{10+2\sqrt{5}})/8}$ 2) $\sqrt{10+2\sqrt{5}}/8$ 3) $\sqrt{4-\sqrt{10+2\sqrt{5}}}/8$ 4) $\sqrt{10-2\sqrt{5}}/8$

50. $\tan5x-\tan3x-\tan2x$=____ (1991)

1)$\tan5x\tan3x\tan2x$ 2) $\tan2x\tan3x\cot5x$

3) $\cot3x\cot5x\cot2x$ 4) $\tan3x\cot2x\tan5x$

51. $\cos^2\pi/12+\cos^2\pi/4+\cos^2 5\pi/12$ =_____ (1993)

1) 3/4 2) 1 3) 3/2 4) 2/3

52. If $\sin x+\sin^2 x=1$ then $\cos^8 x+2\cos^6 x+\cos^4 x$=___ (1994)

1)1 2)2 3) 3 4)0

53. If x=y cos $2\pi/3$ = z cos $4\pi/3$ then xy+yz+zx=____ (1994)
1) 1 2)2 3)3 4)0

54. If A lies in 3rd quadrant and 3 tanA–4=0 then 5sin2A+3sinA+4cos A=__ (1994)
1)0 2) –(24)/5 3) 24/5 4) 48/5

55. tan $7\frac{1}{2}^{0}$ =_____ (1995)
1) √6-√4-√3+√2 2) √6-√4-√3-√2 3) √6-√4-√2-1 4) √5-√4-√3-√2

56. $\frac{3Cos\theta + Cos3\theta}{3Sin\theta - Sin3\theta} =$
1)cotθ 2) $\cot^3\theta$ 3) $\tan^3\theta$ 4) tanθ

57. If A= $\sin^2\theta+\cos^4\theta$ then for all values of θ where (1996)
1) $1\leq A\leq 2$ 2)$3/4 \leq A\leq 1$ 3) $0\leq A\leq 1$ 4) $1/4\leq A\leq 1/2$

58. If A+B+C =180^0 then tanA/2tan B/2+ tan B/2tanC/2+ tan C/2tan A/2=(1996c)
1) 0 2) 1 3)-1 4) $\frac{1}{2}$

59. (Sinx) / [sin(x/8)]=____ (1996c)
1)8cos (x/8) sin(x/4) cos (x/2) 2) 8cos(x/3) cos (9x/4) sin(x/2)
3) 8cos(9x/8) cos(x/4) cos(x/2) 4) 8sin(x/8) sin(x/4) sin(x/2)

60. If 3sinα=5 sinβ then $\frac{\tan\frac{\alpha+\beta}{2}}{\tan\frac{\alpha-\beta}{2}}$ = (1996c)
1)1 2)2 3)3 4)4

61. (1-sec8θ)/ (1-sec4θ) = (1997)
1) tan8θ 2) cot8θ 3) tan2θ cot 8θ 4) tan8θ cot 2θ

62. If $180^0 < \theta < 270^0$ and sin θ = -3/5 find cos θ/2 (1997)
1) -4/5 2) -5/4 3) -√10 4) -1/√10

63. $\frac{\sin3\theta}{1+2\cos2\theta}$ = (1997)
1)cos θ 2) sin θ 3) tan θ 4)sec θ

64. If x = $\sqrt{\frac{(1-Cos\theta)}{1+Cos\theta}}$ then $2x/(1-x^2)$= (1996, 97)
1)±tanθ 2) +tan2θ 3) ±cot θ 4) ±cot 2θ

65. $\frac{-\sin\theta + \sin 2\theta}{1-\cos\theta + \cos 2\theta} =$ (1999)

1) $\sin\theta$ 2) $\cos\theta$ 3) $\tan\theta$ 4) $\cot\theta$

66. If $\operatorname{cosec}\theta = \frac{(p+q)}{(p-q)}$, $(\cot \Pi/4 + \theta/2) =$_____ (2001)

1) $\frac{p}{q}$ 2) $\frac{q}{p}$ 3) $\sqrt{\left(\frac{p}{q}\right)}$ 4) $\sqrt{\left(\frac{q}{p}\right)}$

67. $\sum_{k=1}^{3} Cos^2 \frac{(2k-1)\pi}{12}$ (2002)

1)0 2)1/2 3)-1/2 4)3/2

68. $\sin 47^0 - \sin 25^0 + \sin 61^0 - \sin 11^0 =$____ (2003)

1)$\cos 7^0$ 2)$\sin 7^0$ 3)$2\cos 7^0$ 4)$2\sin 7^0$

69. $\tan 9^0 - \tan 27^0 - \tan 63^0 + \tan 81^0 =$___ (2004)

1)4 2)3 3)2 4)1

70. $\frac{Tan3A}{TanA} = a \Rightarrow \frac{Sin3A}{SinA}$

1)2a/a+1 2)2a/a-1 3)a/a+1 4)a/a-1

71. The quadratic equation whose roots are $\sin^2 18^0$ and $\cos^2 36^0$ is: (2006)

1)$16x^2 - 12x + 1 = 0$ 2)$16x^2 + 12x + 1 = 0$ 3)$16x^2 - 12x - 1 = 0$ 4)$16x^2 + 10x + 1 = 0$

72. If $x = \tan 15^0$, $y = \operatorname{cosec} 75^0$ and $x = 4\sin 18^0$, then (2006)

1)x<y<z 2)y<z<x 3)z<x<y 4)x<z<y

73. If $\tan\theta + \tan\left(\theta + \frac{\pi}{3}\right) + \tan\left(\theta + \frac{2\pi}{3}\right) = 3$ then which of the following is equal to 1? (2008)

1) $\tan 2\theta$ 2) $\tan 3\theta$ 3) $\tan^2\theta$ 4) $\tan^3\theta$

74. $\cos A \cos 2A \cos 4A \ldots\ldots\ldots \cos 2^{n-1} A =$ (2010)

1) $\frac{\sin 2^n A}{2^n \sin A}$ 2) $\frac{2^n \sin 2^n A}{\sin A}$ 3) $\frac{2^n \sin A}{\sin 2^n A}$ 4) $\frac{\sin A}{2^n \sin 2^n A}$

75. $\tan x + \tan\left(x + \frac{\pi}{3}\right) + \tan\left(x + \frac{2\pi}{3}\right) = 3 \Rightarrow \tan 3x =$ (2012)

1) 3 2) 2 3) 1 4) 0

76. $3\sin x + 4\cos x = 5 \Rightarrow 6\tan\frac{x}{2} - 9\tan^2\frac{x}{2} =$ (2012)

1) 0 2) 1 3) 3 4) 4

77. $\tan 81^0 - \tan 63^0 - \tan 27^0 + \tan 9^0 =$ (2014)

1) 0 2) 2 3) 4 4) 6

78. If $A = sin^2\theta + cos^4\theta$, then for all values of θ A lies in the interval (2015)

1) [1, 2] 2) $\left[\frac{3}{4},1\right]$ 3) $\left[\frac{1}{2},\frac{3}{4}\right]$ 4) $\left[\frac{3}{4},\frac{19}{16}\right]$

79. $tan\frac{\pi}{3} + 2\,tan\frac{2\pi}{5} + 4\,cot\frac{4\pi}{5} =$ (2015 A.P)

1) $cot\frac{\pi}{5}$ 2) $cot\frac{2\pi}{5}$ 3) $cot\frac{3\pi}{5}$ 4) $cot\frac{4\pi}{5}$

80. If $\cos\theta = \frac{\cos\alpha - \cos\beta}{1-\cos\alpha\cos\beta}$, then one of the values of $\tan\left(\frac{\theta}{2}\right)$ is (2016AP)

1) $\cot\frac{\beta}{2}\tan\frac{\alpha}{2}$ 2) $\tan\alpha\tan\frac{\beta}{2}$

3) $\tan\frac{\beta}{2}\tan\frac{\alpha}{2}$ 4) $\tan^2\frac{\alpha}{2}\tan^2\frac{\beta}{2}$

81. The value of the expression $\frac{1+\sin 2\alpha\cos}{\cos(2\alpha-2\pi)\tan\left(\alpha-\frac{3\pi}{4}\right)} - \frac{1}{4}\sin 2\alpha\left(\cot\frac{\alpha}{2}+\cot\left(\frac{3\pi}{2}+\frac{\alpha}{2}\right)\right)$ is (2017)

1) 0 2) 1 3) $\sin^2\frac{\alpha}{2}$ 4) $\sin^2\alpha$

82. $\cos^4\frac{\pi}{12}+\cos^4\frac{5\pi}{12}+\cos^4\frac{7\pi}{12}+\cos^4\frac{11\pi}{12} =$ (2017AP)

1) 2 2) 1 3) 7/4

4) 3/2

KEY

1) **3**	2) **1**	3) **1**	4) **4**	5) **3**	6) **1**	7) **2**	8) **3**	9) **2**	10) **4**
11) **4**	12) **3**	13) **4**	14) **1**	15) **2**	16) **1**	17) **4**	18) **4**	19) **4**	20) **1**
21) **1**	22) **3**	23) **4**	24) **2**	25) **4**	26) **1**	27) **3**	28) **4**	29) **1**	30) **1**
31) **1**	32) **2**	33) **4**	34) **1**	35) **1**	36) **2**	37) **4**	38) **3**	39) **3**	40) **1**
41) **1**	42) **3**	43) **3**	44) **3**	45) **2**	46) **3**	47) **2**	48) **1**	49) **1**	50) **1**
51) **3**	52) **1**	53) **4**	54) **1**	55) **1**	56) **2**	57) **3**	58) **2**	59) **1**	60) **4**
61) **4**	62) **4**	63) **3**	64) **1**	65) **3**	66) **4**	67) **4**	68) **1**	69) **1**	70) **2**
71) **1**	72) **1**	**73)3**	**74) 1**	**75) 3**	**76)2**	**77)3**	**78) 2**	**79) 1**	**80)1**
81) **4**	82) **3**								

AIEEE PROBLEMS

1. If $0 < x < \pi$, and $\cos x + \sin x = 1/2$ then $\tan x =$ [2006]
   1) $-(4+\sqrt{7})/3$ 2) $(1+\sqrt{7})/4$ 3) $(1-\sqrt{7})/4$ 4) $(4-\sqrt{7})/3$
   (Key: 1)

Exercise-B

1. If $\sin\theta = 1/\sqrt{3}$, then $\cos 2\theta =$ ____
   1)1/2 2)1/3 3)1/5 4)1/8

2. If $450^0 < A < 540^0$, $\sin A = 3/5$, then $\cos A/2 =$ ___
   1)$3/\sqrt{10}$ 2)$-3/\sqrt{10}$ 3)$1/\sqrt{10}$ 4)$-1/\sqrt{10}$

3. $8 \sin\theta \cos\theta \cos 2\theta \cos 4\theta =$ ____
   1)$\sin 8\theta$ 2)$\cos 8$ 3)$\sin 4\theta$ 4)$\cos 4\theta$
4. $1-3/4 \sin^2 2A =$ ____
   1)$1/4(1+3\cos^2 2A)$ 2)$1/4(1-3\cos^2 2A)$
   3)$1/4(1+2\cos^2 3A)$ 4)$1/4(1-2\cos^2 3A)$

5. $\sin 2\theta/1+\cos 2\theta =$ __
   1)$\sin\theta$ 2)$\cos\theta$ 3)$\tan\theta$ 4)$\cot\theta$

6. $\dfrac{1-\cos 2\theta}{\sin 2\theta} =$ ___
   1) $\sin\theta$ 2) $\cos\theta$ 3)$\tan\theta$ 4)$\cot\theta$

7. $\dfrac{\sin\theta+\sin 2\theta}{1+\cos\theta+\cos 2\theta} =$ _____
   1)$\tan\theta/2$ 2)$\cot\theta/2$ 3)$\tan\theta$ 4)$\cot\theta$

8. $\dfrac{1+\cos\theta+\sin\theta}{1-\cos\theta+\sin\theta} =$
   1)$\sin\theta/2$ 2)$\cos\theta/2$ 3)$\tan\theta/2$ 4)$\cot\theta/2$

9. $\dfrac{\sin 3\theta}{\sin\theta} - \dfrac{\cos 3\theta}{\cos\theta} =$
   1)2 2)$\sqrt{3}$ 3)$\sqrt{2}$ 4)1

10. $\dfrac{\cos 3\theta - \sin 3\theta}{\cos\theta+\sin\theta} =$
   1)$1+2\sin 2\theta$ 2)$1-2\sin 2\theta$ 3)$1+2\cos 2\theta$ 4)$1-2\cos 2\theta$

11. $\dfrac{\sin^3\theta+\sin 3\theta}{\cos^3\theta-\cos 3\theta} =$

1)$\tan^3\theta$ 2)$\cot^3\theta$ 3)$\cot\theta$ 4)$\tan\theta$

12. $\frac{3\cos\theta+\cos3\theta}{3\sin\theta-\sin3\theta}$ =

1)$1+\cot^2\theta$ 2) $\cot^4\theta$ 3)$\cot^3\theta$ 4)$2\cot\theta$

13. $\frac{\sin^3A+\sin3A}{\sin A}$ + $\frac{\cos^3A-\cos3A}{\cos A}$ =

1)0 2)1 3)2 4)3

14. $\frac{\sin3A}{1+2\cos2A}$ =

1)sinA 2)cosA 3)tanA 4)cotA

15. $\frac{1-\sec8\theta}{1-\sec4\theta}$ =

1)$\sin8\theta\cos2\theta$ 2)$\tan8\theta\cot2\theta$ 3)$\sec8\theta\cot2\theta$ 4)$\cot\theta$

16.If $A=2\sin^2\theta-\cos2\theta$, then

1) $-1\leq A\leq3$ 2) $1\leq A\leq2$ 3) $-2\leq A\leq4$ 4) $1\leq A\leq3$

17.If $A=\sin^2\theta+\cos^4\theta$, then for all real values of θ, where

1) $1\leq A\leq2$ 2) $3/4\leq A\leq1$ 3) $0\leq A\leq1$ 4) $1/4\leq A\leq1/2$

18.If $180\leq A\leq270$, $\sin\theta= -3/5$, then $\cos A/2=$

1)$-1/\sqrt{10}$ 2)$1/\sqrt{10}$ 3)1/10 4)10

19.If A is in the III Quadrant, $3\tan A-4=0$ then $5\sin2A+3\sin A+4\cos A=$

1)0 2)-24/5 3)24/5 4)5/24

20.If tan350=k, then the value of $\frac{\tan145^0-\tan125^0}{1+\tan145^0\tan125^0}$ =

1)$-2k/(1-k^2)$ 2)$2k/(1+k^2)$ 3)$(1-k^2)/2k$ 4)$(1-k^2)/(1+k^2)$

21.If sin30+cos30 is

1)>0 2) =0 3) <0 4) ≤0

22. $\cos\frac{2\pi}{5}\cos\frac{4\pi}{15}\cos\frac{8\pi}{15}\cos\frac{14\pi}{15}$ =

1)1/4 2)1/8 3)1/16 4)1/32

23. $\sin12^0\sin24^0\sin48^0\sin84^0$ =

1) $\cos20^0\cos40^0\cos60^0\cos80^0$ 2) $\sin20^0\sin40^0\sin60^0\sin80^0$ 3)3/15 4)3/24

24. $\cos^236^0+\cos^272^0$ =

1)1 2)2/3 3)-2/3 4)3/4

25. $\frac{\tan 2A - \tan A}{\tan A}$

1) cosA 2) cos2A 3)secA 4)sec2A

26. $\tan\left(7\frac{1}{2}\right)^0 =$

1) $\frac{2\sqrt{2} - (1+\sqrt{3})}{\sqrt{3} - 1}$ 2) $\frac{1+\sqrt{3}}{1 - \sqrt{3}}$ 3) $\frac{1}{\sqrt{3}} + \sqrt{3}$ 4) $2\sqrt{2} + \sqrt{3}$

27. $\tan 82(1/2)^0 =$

1) $\sqrt{2} + \sqrt{3} + \sqrt{4} + \sqrt{6}$ 2) $\sqrt{2} + \sqrt{3} - \sqrt{4} + \sqrt{6}$ 3) $\sqrt{2} - \sqrt{3} + \sqrt{4} - \sqrt{6}$ 4) $\sqrt{2} - \sqrt{3} - \sqrt{4} + \sqrt{6}$

28. If $x = \sqrt{[(1-\cos\theta)/(1+\cos\theta)]}$ then $2x/(1-x^2) =$

1) $\sin\theta$ 2) $\cos\theta$ 3) $\tan\theta$ 4) $\cot\theta$

29. $1/(\sin 10^0) - \sqrt{3}/(\cos 10^0) =$

1)1 2)2 3)3 4)4

30. $\sqrt{3}\,\mathrm{cosec}\,20^0 - \sec 20^0 =$

1)4 2)3 3)2 4)1

31. If $\tan\beta = 2\sin\alpha \sin\gamma \,\mathrm{cosec}\,[\alpha+\gamma]$, then $\cot\alpha, \cot\beta, \cot\gamma$ are in

1)A.P 2)G.P 3)H.P 4)A.G.P

32. If $\frac{x}{\tan(\theta+\alpha)} = \frac{y}{\tan(\theta+\beta)} = \frac{z}{\tan(\theta+\gamma)}$ then $\sum \frac{x+y}{x-y}\sin^2[\alpha-\beta] =$

1)1 2)-1 3)0 4)1/2

33. $\sin^4 \pi/8 + \sin^4 3\pi/8 + \sin^4 5\pi/8 + \sin^4 7\pi/8 =$

1)1/2 2)1/4 3)3/2 4)3/4

34. If $\tan\frac{\theta}{2} = \sqrt{\frac{1-e}{1+e}}\tan\frac{\alpha}{2}$ then $\cos\propto =$

1) $\frac{1 - e\cos\theta}{e + \cos\theta}$ 2) $\frac{1 + e\cos\theta}{\cos\theta + e}$ 3) $\frac{1 - e\cos\theta}{\cos\theta - e}$ 4) $\frac{\cos\theta - e}{1 - e\cos\theta}$

35. $2\sin^2\beta + 4\cos(\alpha+\beta)\sin\alpha\sin\beta + \cos(2\alpha+2\beta) =$

1) $\sin 2\alpha$ 2)$\cos 2\alpha$ 3)$\tan 2\alpha$ 4)$\cot 2\alpha$

36. If $\cos(\theta - \alpha)$, $\cos\theta$, $\cos(\theta+\alpha)$ are in H.P then $\cos\theta \sec\alpha/2 =$

1) $\pm\frac{1}{\sqrt{2}}$ 2) $\pm\sqrt{2}$ 3) ± 1 4) $\pm\frac{1}{2}$

37. $\cos^4 \pi/8 + \cos^4 3\pi/8 + \cos^4 5\pi/8 + \cos^4 7\pi/8 =$

1) 1/2 2) 3/2 3) 1/4 4) 3/4

38. If $\frac{\sin\alpha}{a} = \frac{\cos\alpha}{b}$ then $a\sin 2\alpha + b\cos 2\alpha =$

1) a 2) b 3) a + b 4) 0

39. If $0 < \theta < \frac{\pi}{2}, \sin 2\theta = \cos 3\theta$ then $\sin\theta =$

1) $\frac{\sqrt{5}-1}{4}$ 2) $\frac{\sqrt{5}+1}{4}$ 3) 0 4) $\frac{\sqrt{10-2\sqrt{5}}}{4}$

40. If $\cos\alpha = \frac{3}{5}, \cos\beta = \frac{5}{13}$ then $\cos^2\left(\frac{\alpha-\beta}{2}\right) =$

1) $\frac{64}{65}$ 2) $\frac{1}{65}$ 3) $\frac{65}{64}$ 4) 65

41. If $A = \tan 6^0 \tan 42^0$, $B = \cot 66^0 \cot 78^0$ then

1) A = 2B 2) A = B 3) B = 2A 4) 3A = 2B

42. If cosx = tany, coty = tany, cotz = tanx then sinx =

1) $\sin 18^0$ 2) $\frac{1}{2}\sin 18^0$ 3) $\sin 36^0$ 4) $2\sin 18^0$

43. If $\cos A = \frac{3}{4}$ then $32\sin\frac{A}{2}\sin\frac{5A}{2} =$

1) 10 2) – 11 3) 11 4) 13

44. If $A = \sin^2\theta + \cos^4\theta$ then

1) $1 \le A \le 2$ 2) $\frac{3}{4} \le A \le 1$ 3) $0 \le A \le 1$ 4) $\frac{1}{4} \le A \le \frac{1}{2}$

45. $\left(1+\cos\frac{\pi}{10}\right)\left(1+\cos\frac{3\pi}{10}\right)\left(1+\cos\frac{7\pi}{10}\right)\left(1+\cos\frac{9\pi}{10}\right) =$

1) $\frac{1}{8}$ 2) $\frac{1}{16}$ 3) $\frac{1}{4}$ 4) 1

46. If $\log_2(\sin x) - \log_2(\cos x) - \log_2(1-\tan x) - \log_2(1+\tan x) = -1$ then tan2x =

1) 0 2) 1 3) – 1 4) 2

47. $\frac{1-\tan^2(45^0-\theta)}{1+\tan^2(45^0-\theta)} =$

1) $\sin 2\theta$ 2) $\cos 2\theta$ 3) $\tan 2\theta$ 4) $\cot 2\theta$

48. $\cos^2 25^0 + \cos^2 35^0 - \cos 25^0 \cos 35^0 =$

1) $\frac{1}{4}$ 2) $\frac{3}{4}$ 3) $\frac{5}{4}$ 4) $\frac{1}{2}$

49. In a ΔABC, A > B if A & B satisfy the equation $3\sin x - 4\sin^3 x - k = 0$, $0 < k < 1$ then c =

1) $\frac{\pi}{2}$ 2) $\frac{3\pi}{4}$ 3) $\frac{2\pi}{3}$ 4) $\frac{5\pi}{6}$

50. $\cos\frac{\pi}{7} - \cos\frac{2\pi}{7} + \cos\frac{3\pi}{7} =$

1) $\frac{3}{2}$ 2) $\frac{1}{2}$ 3) $\frac{-1}{2}$ 4) $\frac{-3}{2}$

KEY

1) 2	2) 4	3) 1	4) 1	5) 3	6) 3	7) 3	8) 4	9) 1	10) 2
11) 3	12) 3	13) 4	14) 1	15) 2	16) 1	17) 2	18) 1	19) 1	20) 1
21) 1	22) 3	23) 1	24) 4	25) 4	26) 1	27) 1	28) 3	29) 4	30) 1
31) 1	32) 3	33) 3	34) 4	35) 2	36) 2	37) 2	38) 2	39) 1	40) 1
41) 2	42) 4	43) 3	44) 2	45) 3	46) 2	47) 1	48) 2	49) 3	50) 2

9. TRANSFORMATION

1. $SinC + SinD = 2Sin\frac{(C+D)}{2}Cos\frac{(C-D)}{2}$

2. $SinC - SinD = 2Cos\frac{(C+D)}{2}Sin\frac{(C-D)}{2}$

3. $CosC + CosD = 2Cos\frac{(C+D)}{2}Cos\frac{(C-D)}{2}$

4. $CosC - CosD = 2Sin\frac{(C+D)}{2}Sin\frac{(C-D)}{2}$

5. $Sin(A+B) + Sin(A-B) = 2SinACosB$

6. $Sin(A+B) - Sin(A-B) = 2CosASinB$

7. $Cos(A+B) + Cos(A-B) = 2CosACosB$

8. $Cos(A+B) - Cos(A-B) = 2SinASinB$

If A+B+C = 180^0 then

9. sin2A+sin 2B +sin2C = 4sinA sinB sinC

10. sin2A+sin2B-sin2C= 4cos A cos B sinC

11. sin2A – sin2 B +sin2C= 4 CosA sinB CosC

12. sin2A-sin2B-sin2C =-(sin2B+sin2C-sin2A)=-4sinACosBcosC

13. Cos 2A+Cos2B+Cos2C=-1-4Cos A Cos B Cos C

14. Cos 2A+Cos 2B-Cos2C=1-4sinA sin B cosC

15. Cos2A-cos2B+cos2C=1-4 sin A cos B sinC

16. Cos 2A-cos 2B-Cos2C= -(cos2B+cos2C-cos2A)
=-(1-4 cos A sin B sinC)
= -1 +4 cos A sin B sinC

17. Cos A +CosB +Cos C=1+4Sin $\frac{A}{2}$ Sin $\frac{B}{2}$ Sin $\frac{C}{2}$

18. Cos A +CosB -Cos C=-1+4Cos $\frac{A}{2}$ Cos $\frac{B}{2}$ Sin $\frac{C}{2}$

19. Cos A - CosB +Cos C=-1+4cos $\frac{A}{2}$ Sin $\frac{B}{2}$ Cos $\frac{C}{2}$

20. Cos A -CosB -Cos C=1-4Sin $\frac{A}{2}$ Cos $\frac{B}{2}$ Cos $\frac{C}{2}$

21. SinA+SinB+SinC= 4Cos $\frac{A}{2}$ Cos $\frac{B}{2}$ Cos $\frac{C}{2}$

22. SinA+SinB-SinC= 4Sin $\frac{A}{2}$ Sin $\frac{B}{2}$ Cos $\frac{C}{2}$

23. SinA-SinB+SinC= 4Sin $\frac{A}{2}$ Cos $\frac{B}{2}$ Sin $\frac{C}{2}$

24. SinA-SinB-SinC= -4Cos $\frac{A}{2}$ Sin $\frac{B}{2}$ Sin $\frac{C}{2}$

If A+B+C=90^0

25. CotA +CotB +Cot C= CotACotBCotC

26. tanAtanB+tanBtanC+tanCtanA=1

27. $Cos\,\theta Cos\,2\theta Cos\,3\theta Cos\,4\theta .....Cos\,2^{n-1}\theta = \frac{Sin\,2^n\theta}{2^n\,Sin\,\theta}$

Exercise

1. Cos20^0Cos100^0 + Cos100^0 Cos140^0 - Cos140^0 Cos200^0 =
   1) $-\frac{1}{2}$ 2) $\frac{2}{3}$ 3) $-\frac{3}{4}$ 4) $\frac{4}{5}$

2. 1+cos 2θ + cos 4θ+ cos 6θ=
   1) 4cosθ cos2θcos3θ 2) 2cosθ cos2θ cos3θ
   3) 6cosθ cos2θcos3θ 4)8cosθcos2θcos3θ

3. 1+cos 2x+cos 4x + cos 6x-4cosx cos2x cos 3x=
   1) 1 2) 2 3) 3 4) 0

4. sin A + sin 3A + sin 5A + sin 7A =
   1)cosA cos2 A sin 4A 2) 2cosA sin2Acos4A

3) 4cosA cos 2A sin 4A 4)2sin4Acos2A CosA

5. If A+B+C= 180^0 ^{2}A/2 –cos^2 B/2 - cos^{2}C/2=
   1)-2 $\sin\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$ 2) –$\sin\frac{A}{2}\cos\frac{C}{2}\sin\frac{B}{2}$
   3) 1-2$\sin\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$ 4) 1

6. If A+B+C= 180^0 then cos^{2}A-cos^{2}B+ cos^{2}C=
   1)2 sin A sin B sinC 2)1 -2 sinA cos B sinC 3) 1-2 sinA cos B sin C 4) 1

7. If A+B+C= 180^0 then $\frac{\sin 2A-\sin 2B+\sin 2C}{\sin 2A+\sin 2B-\sin 2C}$
   1) Tan A cot B 2) Tan B cot C 3) Tan C cot A 4) TanC cot B

8. If A+B+C =π then $\sin^2\frac{A}{2}-\sin^2\frac{B}{2}+\sin^2\frac{C}{2}=$
   1) $2\cos\frac{A}{2}\sin\frac{B}{2}\cos\frac{C}{2}$ 2) $1-2\cos\frac{A}{2}\sin\frac{B}{2}\cos\frac{C}{2}$
   3) $\sin\frac{A}{2}\cos\frac{B}{2}\sin\frac{C}{2}$ 4) $-2\sin\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$

9. If A+B+C =π then cosA +2 cos 3A +cos5A=
   1) Tan A 2) Tan 2A 3) Tan3A 4) 2 tan A

10. $\frac{\sin\alpha+\sin 2\alpha+\sin 3\alpha}{\cos\alpha+\cos 2\alpha+\cos 3\alpha}=$
   1) Tanα 2) ½ Tanα 3) 2Tan α 4) tan2α

11. $\frac{\sin A+\sin 3A+\sin 5A+\sin 7A}{\cos A+\cos 3A+\cos 5A+\cos 7A}=$
   1) Tan 2A 2) Tan4A 3) Tan 6A 4) Tan8A

12. $\frac{\text{SinA +2sin3A +sin5A}}{\text{cosA +2 cos 3A +cos5A}}=$
   1) Tan A 2) Tan 2A 3) Tan3A 4) 2 tan A

13. If A+B+C = 180^0 then tannA+tannB+tannC=_____
   1) Tan A tan B tan c 2) cot nA cot nB cot nc 3) 1 4) 0

14. cos α + cos β+cosγ + cos [α+β+γ] =_____
   1) $4\cos\frac{(\alpha+\beta)}{2}\cos\frac{(\beta+\gamma)}{2}\cos\frac{\gamma}{2}$

2) $4\cos\frac{(\alpha+\beta)}{2}\cos\frac{(\beta+\gamma)}{2}\cos\frac{(\gamma+\alpha)}{2}$

3)$4\cos\alpha\cos\beta\cos\gamma$ 4) 4

15. If sinx+siny= $\frac{3}{4}$ and sinx-siny= $\frac{2}{5}$ then $8Cot\frac{(x-y)}{2}-15Cot\frac{(x+y)}{2}=$

1)1 2) 2 3)3 4) 0

16. cos (π/11) cos (2π/11) cos (3π/11) cos (4π/11) cos (5π/11) =_____

1)1/16 2)1/32 3) 16 4) 1/64

17. $\cos 12^0 \cos 24^0 \cos 36^0 \cos 48^0 \cos 72^0 \cos 84^0$=-_____

1) 1/4 2) 1/8 3) 1/16 4) 1/64

18. $\cos 24^0$ cos 48 $\cos 96^0 \cos 192^0$=_____

1) 1/16 2) 3/8 3) 2/9 4) 1/16

19. $\cos 6^0$ $\cos 42^0 \cos 66^0 \cos 72^0$=_____

1)4 2) 16 3) 1/16 4) 1

20. If sin (y+z-x), sin (z+x-y) and sin (x+y-z) are in A.P. then cotx, coty, cotz are in _

1) A.P 2) G.P 3) H.P 4) A.G.P

21. $\sin 21^0$ $\cos 9^0 - \cos 84^0 \cos 6$=

1) 1 2)1/2 3) 1/4 4)2

22. $\frac{\sin 75^0 - \sin 15^0}{\cos 15^0 - \cos 75^0}$ =

1) 1 2)2 3) -2 4)-1

23. $\frac{\sin 65^0 + \sin 25^0}{\cos 65^0 + \cos 25^0}$ =

1) 0 2) 1 3)2 4) 3

24. $\frac{\cos(45+A) - \cos(45-A)}{\sin(120^0+A) - \sin(120-A)}$ =

1)2 2) √2 3) 1/√2 4) 1/2

25. Cos(π/5)Cos(2π/5)cos(4π/5)Cos(8π/5)=

1)2/16 2)1/16 3)-1/16 4)-2/16

26. $\tan 20^0 \tan 40^0 \tan 60^0 \ldots \tan 180^0$=

1) 1 2) 2 3)3 4) 0

27. Cot 29^0 +cot 30^0 + cot 31^0=

1) cot 29^0 cot 30^0 cot 31^0 2)-1 3) –cot 29^0 cot30^0 cot 31^0 4) 1/3

28. If A+B+C =180^0

$$\frac{\text{Sin2A+sin2B+sin2C}}{\text{CosA+CosB+cosC-1}} =$$

1) 4cos A/2 cos B/2 cos C/2 2) 6cos A/2cos B/2 cosc/2

3) 8cosA/2 cosB/2 cosC/2 4) 1

29. If A+B+C= ∏ then cot A cot B+ Cot B cot C + Cot C Cot A=____

1) cot (A+B+C) 2) Σ cot A cot B 3)1 4)-1

30. If A+B+C = ∏ then Cot A/2 + Cot B/2 + Cot C/2=____

1) cot A/2 cot B/2 cot C/2 2) –cot A/2 cot B/2 cot C/2

3) 1 4) Tan A/2 tan B/2 TanC/2

31. I : $\sin\theta \sin(60°-\theta)\sin(60°+\theta) = \frac{1}{4}\sin 3\theta$

II: $\cos\theta\cos(120°-\theta)\cos(120°+\theta) = \frac{1}{4}\cos 3\theta$

1)only I is true 2)only II is true 3)Both I and II are true 4) Neither I nor II is true.

32. tan9-tan27-tan63+tan81=

1)1 2)2 3)3 4) 4

33. Match the following

I. $\frac{\text{sinA+sin5A+sin9A}}{\text{cosA+cos5A+cos9A}} =$ a)tan2A

II. $\frac{\text{cosA+cos3A+cos5A+cos7A}}{\text{sinA+sin3A+sin5A+sin7A}} =$ b)cot4A

III. $\frac{\text{sinAsin3A+sin3Asin7A+sin5Asin15A}}{\text{sinAcos3A+sin3Acos7A+sin5Acos15A}} =$ c)tan5A

IV. $\frac{\text{sin8AcosA-sin6Acos3A}}{\text{Cos2AcosA-sin3Asin4A}} =$ d)tan11A

1)d,b,a,c 2)c,b,d,a 3)a,c,b,d 4)b,d,c,a

34. Match the following :

If cos x +cos y =a

sin x – sin y =b

then match the following.

List -I	List – II
1. tan (x-y)/2	a. $(a^2-b^2)/(a^2+b^2)$
2. sin(x-y)	b. $2ab/(a^2-b^2)$
3. cos(x-y)	c. b/a
4. tan(x-y)	d. $2ab/(a^2+b^2)$

1)c,d,a,b 2)b,c,a,b 3)d,a,b,c 4)a,d,b,c

35. A: If $x+y+z=xyz$ then $\Sigma[2x/(1-x^2)] = \pi[2x/(1-x^2)]$
R: If $\tan A+\tan B+\tan C=\tan A\tan B\tan C$ then $A+B+C=n\pi$, $n\in N$.

1)A is true, R is true and R is correct explanation of A
2)A is true, R is true and R is not correct explanation of A
3)A is true , R is false
4)A is false, R is true

PREVIOUS EAMCET PAPER'S PROBLEMS

36. If $\sin 18^0 = \frac{\sqrt{5}-1}{4}$ then $\sin 81^0$ = (1990)

1) $\frac{\sqrt{4+\sqrt{10+2\sqrt{5}}}}{8}$ 2) $\frac{\sqrt{10+2\sqrt{5}}}{8}$ 3) $\frac{\sqrt{4-\sqrt{10+2\sqrt{5}}}}{8}$ 4) $\frac{\sqrt{10-2\sqrt{5}}}{8}$

37. $\tan 5x-\tan 3x-\tan 2x$=____ (1991)
1) $\tan 5x \tan 3x \tan 2x$ 2) $\tan 2x \tan 3x \cot 5x$
3) $\cot 3x \cot 5x \cot 2x$ 4) $\tan 3x \cot 2x \tan 5x$

38. $\cos^2 \pi/12 + \cos^2\pi/4 + \cos^2 5\pi/12$ =_____ (1993)
1) 3/4 2) 1 3) 3/2 4) 2/3

39. If $\sin x + \sin^2 x=1$ then $\cos^8 x+2\cos^6 x+\cos^4 x$=___ (1994)
1)1 2)2 3) 3 4)0

40. If $x=y \cos 2\pi/3 = z \cos 4\pi/3$ then $xy+yz+zx$= (1994)
1) 1 2)2 3)3 4)0

41. If A lies in 3rd quadrant and $3 \tan A-4=0$ then $5\sin 2A+3\sin A+4\cos A$=___ (1994)
1)0 2) –(24)/5 3) 24/5 4) 48/5

42. $\frac{3\cos\theta + \cos 3\theta}{3\sin\theta - \sin 3\theta}$ = (1996)
1)$\cot\theta$ 2) $\cot^3\theta$ 3) $\tan^3\theta$ 4) $\tan\theta$

43. If $A= \sin^2\theta+\cos^4\theta$ then for all values of θ where (1996)
1) $1\leq A\leq 2$ 2)$3/4 \leq A\leq 1$ 3) $0\leq A\leq 1$ 4) $1/4\leq A\leq ½$

44. If $A+B+C =180^0$ then $\tan A/2\tan B/2+ \tan B/2\tan C/2+ \tan C/2\tan A/2$=__(1996c)
1) 0 2) 1 3)-1 4) ½

45. $(\sin x) / \sin(x/8)$ =____ (1996c)
1)$8\cos (x/8) \sin(x/4) \cos (x/2)$ 2) $8\cos(x/3) \cos (9x/4) \sin(x/2)$
3) $8\cos(9x/8) \cos(x/4) \cos(x/2)$ 4) $8\sin(x/8) \sin(x/4) \sin(x/2)$

46. (1-sec8θ)/ (1-sec4θ) =____ (1997)
1) tan8θ 2) cot8θ 3) tan2θ cot 8θ 4) tan8θ cot 2θ

47. If $180^0 < \theta < 270^0$ and sin θ = -3/5 find cos θ/2 (1997)
1) -4/5 2) -5/4 3) -√10 4) -1/√10

48. $\frac{Sin3\theta}{1+2Cos2\theta} =$ (1997)
1)cos θ 2) sin θ 3) tan θ 4)sec θ

49. If x = $\sqrt{\frac{1-Cos\theta}{1+Cos\theta}}$ then $2x/(1-x^2)$=_____ (1996, 97)
1)±tanθ 2) +tan2θ 3) ±cot θ 40 ±cot 2θ

50. If cosec θ = $\frac{(p+q)}{(p-q)}$, $(\cot\frac{\pi}{4} + \frac{\theta}{2}) =$_____ (2001)
1)p/q 2) q/p 3) √(p/q) 4) √(q/p)

51. $\sum_{k=1}^{3} \cos^2(2k-1)\,\pi/12=$ (2002)
1)0 2)1/2 3)-1/2 4)3/2

52. $\sin 47^0 - \sin 25^0 + \sin 61^0 - \sin 11^0 =$ ____ (2003)
1)$\cos 7^0$ 2)$\sin 7^0$ 3)$2\cos 7^0$ 4)$2\sin 7^0$

53. $\tan 9^0 - \tan 27^0 - \tan 63^0 + \tan 81^0 =$ (2004)
1)4 2)3 3)2 4)1

54. Sin A + Sin B =√3(Cos B –Cos A) ⇒ sin 3A +Sin 3B = (2007)
1)0 2)2 3)1 4)-1

55. If $\alpha+\beta+\gamma = 2\theta$ then $\cos\theta + \cos(\theta-\alpha) = \cos(\theta-\beta) + \cos(\theta-\gamma) =$ (2008)
1) $4\sin\frac{\alpha}{2}\cos\frac{\beta}{2}\sin\frac{\gamma}{2}$ 2) $4\cos\frac{\alpha}{2}\cos\frac{\beta}{2}\cos\frac{\gamma}{2}$
3) $4\sin\frac{\alpha}{2}\sin\frac{\beta}{2}\sin\frac{\gamma}{2}$ 4) $4\sin\alpha\sin\beta\sin\gamma$

56. $\frac{\cos x}{\cos(x-2y)} = \lambda \Rightarrow \tan(x-y)\tan y =$ (2009)
1) $\frac{1+\lambda}{1-\lambda}$ 2) $\frac{1-\lambda}{1+\lambda}$ 3) $\frac{\lambda}{1+\lambda}$ 4) $\frac{\lambda}{1-\lambda}$

57. If cos(x - y), cos x, cos (x + y) are three distinct numbers which are in harmonic progression and cos x $\neq$ cos y, then 1 + cos y = (2010)

1) Cos^2x 2) $-\cos^2x$ 3) $\cos^2x-1$ 4) $\cos^2x-2$

58. cosA=3/4 $\Rightarrow$ $32\sin\left(\frac{A}{2}\right)\sin\left(\frac{5A}{2}\right)=$ (2011)

1) 7 2) 8 3) 13 4) 11

59. If x & y are acute angles such that cosx+cosy=3/2 & sinx+siny=3/4 then sin(x+y)= (2014)

1) 3/4 2) 3/5 3) 4/5 4) 2/5

60. If $\tan 20^0 = \lambda$, then $\frac{\tan 160^0 - \tan 110^0}{1+\left(\tan 160^0\right)\left(\tan 110^0\right)} =$ (2017)

1) $\frac{1+\lambda^2}{2\lambda}$ 2) $\frac{1+\lambda^2}{\lambda}$ 3) $\frac{1-\lambda^2}{\lambda}$ 4) $\frac{1-\lambda^2}{2\lambda}$

61.If $\frac{\tan(\alpha+\beta-\gamma)}{\tan(\alpha-\beta+\gamma)} = \frac{\tan\gamma}{\tan\beta}$ & $\beta \neq \gamma$, then the value of $\sin 2\alpha + \sin 2\beta + \sin 2\gamma$ is (2017AP)

1) 0 2) 1 3) 2 4) 1/2

KEY

1) **3**	2) **1**	3) **4**	4) **3**	5) **1**	6) **2**	7) **2**	8) **2**	9) **1**	10) **4**
11) **2**	12) **3**	13) **1**	14) **2**	15) **4**	16) **2**	17) **4**	18) **4**	19) **3**	20) **3**
21) **3**	22) **1**	23) **2**	24) **2**	25) **3**	26) **1**	27) **1**	28) **3**	29) **3**	30) **3**
31) **4**	32) **2**	33) **1**	34) **1**	35) **1**	36) **1**	37) **1**	38) **1**	39) **4**	40) **1**
41) **2**	42) **2**	43) **4**	44) **4**	45) **4**	46) **4**	47) **2**	48) **1**	49) **4**	50) **4**
51) **1**	52) **1**	53) **3**	54) **1**	55) **2**	**56) 2**	**57) 1**	**58) 4**	**59)3**	**60)4**
61) **1**	62)	63)	64)	65)					

Exercise-B

1. $\sin 75^0+\sin 15^0=$

1)1/2 2)√3/√2 3) √3/2 4)2/√2

2. $\sin 48^0.\sin 12^0=$

1)(1+√5)/8 2)(1-√5)/8 3)(√5+1)/8 4)(√5-1)/8

3. $2\cos 54^0.\sin 66^0=$

1) $\sqrt{3}/2+\sin 12^0$ 2) $\sqrt{3}/2-\sin 12^0$ 3) $\sqrt{3}/2+\cos 12^0$ 4) $\sqrt{3}/2-\cos 12^0$

4. $\underline{\sin 70^0+\cos 40^0}$ =

$\cos 70^0+\sin 40^0$

1)1/2 2)$\sqrt{3}$ 3)$1\sqrt{3}$ 4)1/2

5. If $\sin\alpha+\sin\beta=a, \cos\alpha+\cos\beta=b$ then $\cos(\alpha+\beta)=$

1)$2ab/a^2+b^2$ 2)ab/a^2+b^2 3)$a^2+b^2/2ab$ 4)$(b^2-a^2)/(b^2+a^2)$

6. If $A+B+C=180^0$, then $\sin 2A+\sin 2B+\sin 2C =$

1)sinAsinBsinC 2)4sinAsinBsinC

3)3 sinAsinBsinC 4)2 sinAsinBsinC

7. If $A+B+C=180^0$then $\cos A-\cos B+\cos C=$

1)1+4sinA/2sinB/2sinC/2 2)-1+4cosA/2cosB/2cosC/2

3)-1+4cosA/2cosB/2cosC/2 4)-1+4cosA/2sinB/2cosC/2

8. If $A+B+C=90^0$ then $\cos 2A +\cos 2B+\cos 2C=$

1)1+4sinAsinBsinC 2)1-2sinAsinBsinC

3)2+2sinAsinBsinC 4)4sinAsinBcosC

9. If $A+B+C=0^0$ then $\sin 2A+\sin 2B+\sin 2C=$

1)sinAcosBcosC 2)2sinAcosBsinC 3)4sinAsinBsinC 4)-4sinAsinBsinC

10. $x=\cot\theta+\cos\theta$ & $y=\cot\theta-\cos\theta$ then$(x^2-y^2)^2=$

1)8 2)4 3)5 4)6

11. If $x \neq 1$, $\theta + \alpha$ not Add Multiple of $\pi/2$ and $\sin\theta = n. \sin(\theta+2\alpha)$, then $(1-n)\cot\alpha+m(\theta+\alpha)=$

1)n+2 2)n+1 3)n-1 4) n

12. If $\alpha=24$, then $\cos\alpha \cos 2\alpha \cos 4\alpha \cos 8\alpha=$ ___

1)1/16 2)1/4 3)-1/16 4)-1/4

13. $\cos 12^0\cos 24^0\cos 36^0 \cos 48^0\cos 72^0\cos 84^0 =$

1)1/84 2)1/44 3)1/64 4)1/12

14. $\cos 12^0+\cos 84^0+\cos 132^0+\cos 156^0=$

1)-1/2 2)1/2 3)±1/2 4)0

15. $\dfrac{\sin(n+1)\theta-\sin(n-1)\theta}{2\cos n\theta+\cos[(n-1)\theta+\cos(n+1)\theta]}$ = ___

1)1/2 2)3/4 3)-1/2 4)-3/4

16. Match the following

I. $\dfrac{\sin A+\sin 5A+\sin 9A}{\cos A+\cos 5A+\cos 9A}$ = a)tan2A

II. $\dfrac{\cos A+\cos 3A+\cos 5A+\cos 7A}{\sin A+\sin 3A+\sin 5A+\sin 7A}$ = b)cot4A

III. $\frac{\sin A\sin 3A+\sin 3A\sin 7A+\sin 5A\sin 15A}{\sin A\cos 3A+\sin 3A\cos 7A+\sin 5A\cos 15A}$ = c)tan5A

IV. $\frac{\sin 8A\cos A-\sin 6A\cos 3A}{\cos 2A\cos A-\sin 3A\sin 4A}$ = d)tan11A

1)d,b,a,c 2)c,b,d,a 3)a,c,b,d 4)b,d,c,a

17. Match the following

I. $\frac{\sin 65^0+\sin 25^0}{\cos 65^0+\cos 25^0}$ = a)$-1/\sqrt{2}$

II. $\frac{\sin 70^0+\cos 40^0}{\cos 70^0+\sin 40^0}$ = b)1

III. $\frac{\cos^2 33^0-\cos^2 57^0}{\sin 21^0-\cos 21^0}$ = c) $\sqrt{3}$

IV. $\frac{1+\cos 56^0+\cos 58^0-\cos 66^0}{\cos 28^0\cos 29^0\sin 33^0}$ = d)4

1)d,b,a,c 2)c,b,d,a 3)a,c,b,d 4)b,d,c,a

18. If A+B+C= 180^0 then $\frac{\sin 2A-\sin 2B+\sin 2C}{\sin 2A+\sin 2B-\sin 2C}$

1) Tan A cot B 2) Tan B cot C 3) Tan c cot A 4) Tan c cot B

19. If sin (y+z-x), sin (z+x-y) and sin (x+y-z) are in A.P. then cotx, coty, cotz are in

1) A.P 2) G.P 3) H.P 4) A.G.P

20. $A+B+C=90^\circ \Rightarrow \sin^2 A+\sin^2 B+\sin^2 C =$

1)1+2cos$A$cosBcosC 2)1+2sin$A$sin BsinC

3)1- 2sin$A$sinBsinC 4) 1-2cos$A$cos$B$cosC

21. 1+cos2x+cos4x+cos6x-4cosxcos2xcos3x=

1) 1 2) – 1 3) 2 4) 0

22. If A + B + C = 0^0 then $\cos^2 A + \cos^2 B + \cos^2 C$ =

1) 1-2cosAcosBcosC 2) 1+2cosAcosBcosC

3) 2(1+cosAcosBcosC) 4) 0

23. $\tan\theta_1 = k\cot\theta_2 \Rightarrow \frac{\cos(\theta_1-\theta_2)}{\cos(\theta_1+\theta_2)} =$

1) $\frac{1+k}{1-k}$ 2) $\frac{1-k}{1+k}$ 3) $\frac{k+1}{k-1}$ 4) $\frac{k-1}{k+1}$

24. $\frac{x}{\tan(\theta+\alpha)} = \frac{y}{\tan(\theta+\beta)} = \frac{z}{\tan(\theta+\gamma)}$ then $\sum \frac{x+y}{x-y}\sin^2(\alpha-\beta) =$

1) 1 2) – 1 3) 0 4) 2

25. $\left(\frac{\cos A+\cos B}{\sin A-\sin B}\right)^{2005} + \left(\frac{\sin A+\sin B}{\cos A-\cos B}\right)^{2005} =$

1) 1 2) – 1 3) 0 4) 2

26. If $\frac{x}{y}=\frac{\cos A}{\cos B}$ then $\frac{x\tan A+y\tan B}{x+y}=$

1) $\cos\left(\frac{A+B}{2}\right)$ 2) $\tan\left(\frac{A+B}{2}\right)$ 3) $\cot(A+B)$ 4) $\tan(A+B)$

27. If an angle α is divided into two parts A & B such that A–B=x & tanA : tanB = k : 1then sinx=

1) $\frac{k+1}{k-1}\sin\alpha$ 2) $\frac{k}{k+1}\sin\alpha$ 3) $\frac{k-1}{k+1}\sin\alpha$ 4) $\frac{k+1}{k}\sin\alpha$

28. If A+B+C=2S then $\cos^2 S + \cos^2(S-A) + \cos^2(S-B) + \cos^2(S-C) =$

1) 2sinAcosBsinC 2) $4\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$

3) 2+2cosAcosBcosC 4) sinAsinB

29. Cosx+cosy=$\frac{1}{3}$ sinx+siny=$\frac{1}{4}$ then sin(x+y)=

1) $\frac{7}{25}$ 2) $\frac{24}{25}$ 3) $\frac{25}{24}$ 4) $\frac{25}{7}$

30. If sin2x = nsin2y then $\frac{\text{Tan}(x+y)}{\text{Tan}(x-y)}=$

1) $\frac{n-1}{n+1}$ 2) $\frac{1-n}{1+n}$ 3) $\frac{1+n}{1-n}$ 4) $\frac{n+1}{n-1}$

31. If $\cos 2B=\frac{\cos(A+C)}{\cos(A-C)}$ then TAnA, TanB, TanC are in

1) A.P 2) G.P 3) H.P 4) A.G.P

32. $\left(\frac{\cos A+\cos B}{\sin A-\sin B}\right)^{2008}+\left(\frac{\sin A+\sin B}{\cos A-\cos B}\right)^{2008}=$

1) $2\cot^{2008}\left(\frac{A+B}{2}\right)$ 2) $2\cot^{2008}\left(\frac{A-B}{2}\right)$

3) $2\tan^{2008}\left(\frac{A+B}{2}\right)$ 4) $2\tan^{2008}\left(\frac{A-B}{2}\right)$

33. $\frac{\sin A+\sin 3A+\sin 5A+\sin 7A}{\cos A+\cos 3A+\cos 5A+\cos 7A}$=tanx $\Rightarrow$ x=

1) 4A 2) 3A 3) 2A 4) A

34. If A+B+C=180^0 then cos2A+cos2B+cos2C+1=

1) -4sinAsinBcosC 2) -4cosAcosBsinC

3) -4cosAcosBcosC 4) -4sinAcosBsinC

35. $2\left(1-2\sin^2 7\theta\right)\sin 3\theta =$

1) $\sin 11\theta - \sin 17\theta$ 2) $\sin 17\theta - \sin 11\theta$

3) $\cos 17\theta - \cos 11\theta$ 4) $\cos 17\theta + \cos 11\theta$

36. If A+B+C=270^0 then cos2A+cos2B+cos2C=

1) 1-4sinAsinBsinC 2) 1-4cosAcosBcosC

3) 4sinAsinBsinC4) 1+2cosAcosBcosC

37. If $\frac{\cos\left(\theta_1-\theta_2\right)}{\cos\left(\theta_1+\theta_2\right)}+\frac{\cos\left(\theta_3+\theta_4\right)}{\cos\left(\theta_3-\theta_4\right)}=0$ then $\tan\theta_1\tan\theta_2\tan\theta_3\tan\theta_4 =$

1) 1 2) 2 3) -1 4) 0

KEY

1) 2	2) 4	3) 1	4) 2	5) 4	6) 2	7) 4	8) 1	9) 4	10) 1
11) 2	12) 1	13) 3	14) 1	15) 4	16) 2	17) 4	18) 2	19) 3	20) 3
21) 4	22) 2	23) 3	24) 3	25) 3	26) 2	27) 3	28) 3	29) 2	30) 4
31) 2	32) 2	33) 1	34) 3	35) 2	36) 1	37) 3			

10. GRAPHS AND PERIODICITY OF TRIGONOMETRIC FUNCTION

1. The period of a function is the least positive value by which the independent variable can be changed so that the value of the function remains unchanged.
2. The period of
   Sinx is 2 Π
   Cosx is 2Π
   Secx is 2Π
   Cosecx i 2Π
3. The period of
   tanx is Π
   cotx is Π
4. The period of sinkx, coskx, seckx, coseckx is 2Π/ |k|
5. The period of tankx and cotkx is Π/|k|
6. If f(a+x) = f(x) then 'a' is the period of f(x).
7. The period of |sinx+cosx| or |sinx-cosx| is Π
8. The period of |tanx+cotx| or |tanx-cotx| is Π/2
9. The period of $\sin^{2n}x + \cos^{2n}x$ or $\sec^{2n}x + \operatorname{cosec}^{2n}x$ or $\tan^{2n}x + \cot^{2n}x$ is Π/2 ($n \in z^{+}$)
10. The period of |sinx| , |cosx|, |tanx|, |secx|, |cotx| and |cosecx| is ∏
11. The period of $a\sin^{2n}x + b\cos^{2n}x$, $a\sin^{2n}x + b\cos^{2m}x$
    $a\sec^{2n}x + b\operatorname{cosec}^{2n}x$, $a\sec^{2n}x + b\operatorname{cosec}^{2m}x$
    $a\tan^{2n}x + b\cot^{2n}x$, $a\tan^{2n}x + b\cot^{2m}x$ is ∏
12. $-1 \le \sin x \le 1$ i.e Min value =-1 and Max.value=1
13. $-1 \le \cos x \le 1$ i.e Min. Value =-1 and Max.value =1
14. $-\infty < \infty \tan x < \alpha$ i.e Min.value = -∞ and max. value = ∞
15. Maximum value of acosx+bsinx+c is $C+\sqrt{a^2+b^2}$
16. Minimum value of acosx+bsinx+c is $C-\sqrt{a^2+b^2}$
17. Graph of sinx is continuous and passes through origin.
18. Graph of cosx is continuous and does not pass through origin.
19. Graph of tanx is discontinuous and pass through origin.
20. Graph of cotx, secx, cosecx, tanx are discontinuous at integral multiple of ∏, ∏/2, respectively.
21. The max.value of $a\sin^2x + b\cos^2x$ is a, if a>b
    The min.value of $a\sin^2x + b\cos^2x$ is b, if a>b
22. The max.value of $\sin^p x - \cos^q x$ is at $x = \operatorname{Tan}^{-1}\sqrt{p/q}$
23. The min.value of a tanx + b cotx is $2\sqrt{ab}$, at $x = \operatorname{Tan}^{-1}\sqrt{b/a}$
24. The min.value of asecx+b cosecx is $(a^{2/3}+b^{2/3})^{3/2}$, at $x=\operatorname{Tan}^{-1}(b/a)^{2/3}$

25. The min.value of $a^2\sec^2x+b^2\operatorname{cosec}^2x$ is $(a+b)^2$, at $x=\operatorname{Tan}^{-1}\sqrt{\ }\ b/a$

26. The min.value of (1+cosecnx (1+secnx) is $(1+2^{n/2})2$ at $x=\pi/4$

27. The min.value of $a^2\sin^2\theta + b^2\operatorname{cosec}^2\theta$
The min.value of $a^2\cos^2\theta + b2\sec^2\theta$
The min.value of $a^2\operatorname{Tan}^2\theta + b^2\cot^2\theta$
} is 2ab

28. The local minimum of a tan x + b cot x is $2\sqrt{ab}$

29. The local minimum of a sec x +b tan x is $\sqrt{a^2-b^2}$.

Exercise-A

The period of

1. $\sin\pi x/2 + \cos \pi x/3$ is_____
   1)4 2) 6 3) 12 4) 3

2. $\sin 2\theta - \cos \theta$ is _____
   1) π 2) 2π 3) $\pi/3$ 4) $2\pi/3$

3. Period of tan x + cot x is _____
   1)$\pi/2$ 2)π 3)$3\pi/2$ 4)2π

4. sin (x+2x+3x) is _____
   1) π 2) $\pi/3$ 3) $2\pi/3$ 4) $\pi/3$

5. Sin^2x is_____
   1) π 2) 2π 3) $2\pi/3$ 4) $\pi/3$

6. Period of sec(x+8x+27x) is
   1)$\pi/18$ 2)$\pi/9$ 3)$2\pi/9$ 4)$\pi/36$

7. $\operatorname{Sin}^4 x + \cos^4 x$ is _____
   1) π 2) $\pi/2$ 3) $2\pi/3$ 4) $\pi/3$

8. sin x sin (60-x) sin (60 +x) is _____
   1) $\pi/3$ 2) $2\pi/3$ 3) π 4) $\pi/4$

9. tan x tan (60 –x) tan (60 +x) is _____
   1) $\pi/3$ 2) $2\pi/3$ 3) $\pi/4$ 4) π

10. tan $(x+4x+9x+\ldots+n^2x)$ is_____
    1) $2\pi / n (n+1) (2n+1)$ 2) $6\pi / n(n+1) (2n+1)$
    3) $4\pi / n(n+!) (2n+1)$ 4) $n(n+1)(2n+1) / 4\pi$

11. $\sin \frac{4x-9}{7}$ is _____

1) $\pi/2$ 2) $3\pi/2$ 3) $5\pi/2$ 4) $7\pi/2$

12. $\cos(x+2x+3x+\ldots+nx)$ is _____

1) 4π 2) $n(n+1)/4\pi$ 3) $\pi/n(n+1)$ 4) $4\pi/n(n+1)$

13. $\sin^4 x$ is _____

1) π 2) 2π 3) $\pi/3$ 4) $\pi/4$

14. $\sin 3x / \cos 2x$ is _____

1) π 2) $\pi/3$ 3) 2π 4) $2\pi/3$

15. $\frac{\cot(5x+3) + \sin(3x+4)}{\sec(3-4x) - \cos(4-6x)}$ is _____

1) π 2) 2π 3) 3π 4) 4π

16. $\frac{\cot(x/4) + \tan(x/4)}{1+\tan(x/2) - \tan x}$ is_____

1) π 2) 2π 3) 3π 4) 4π

17. The sine function having period 2/3 is _____

1) $\sin 3\pi x$ 2) $\sin 2\pi x$ 3) $-\sin 2\pi x$ 4) $-\sin 3\pi x$

18. The cosine function having period 2/5 is _____

1) $\cos 2\pi x$ 2) $\cos 5\pi x$ 3) $\cos 3\pi x$ 4) $-\cos 3\pi x$

19. The tan function having period 2 is _____

1) $\tan \pi x/2$ 2) $\tan 2\pi x$ 3) $\tan 3\pi/2\, x$ 4) $\tan \pi x$

20. Minimum value of $\sin x+\cos x$ =_____

1) $\sqrt{2}$ 2) $\sqrt{3}$ 3) $-\sqrt{3}$ 4) $-\sqrt{2}$

21. Minimum value of $\sin 2x-\cos 2x$=_____

1) $-\sqrt{2}$ 2) $\sqrt{2}$ 3) -2 4) 2

22. Least value of $\sin 2x-\sqrt{3}\cos 2x$ is_____

1) -1 2) -2 3) -3 4) $-\sqrt{3}$

23. Maximum value of $5\cos x+12\sin x+13$=_____

1) 12 2) 13 3) 26 4) -13

24. Minimum value of $7\cos x-24\sin x+5$=_____

1) 10 2) -10 3) 20 4) -20

25. Maximum value of $\cos A-\cos B$ if $A+B=\pi/2$ is _____

1)$\sqrt{2}$ 2) $\sqrt{3}$ 3) $1+\sqrt{2}$ 4) $1-\sqrt{2}$

26. Local minimum value of $\tan\theta + \cot\theta$ is_____
1)1 2)2 3) 3 4)-2

27. Local max. Value of $1+\tan x \tan 2x$=_____
1) 1 2) -2 3)2 4)-1

28. Range of $\sin^2\theta$=_____
1) [0,1] 2)(-1,1) 3) (1,-1) 4) 0,0)

29. Range of $5\cos\theta + 3\cos(60-\theta) + 12$ is _____
1)[5,12] 2) [5,19] 3) [-19,5] 4) [-12,-5]

30. Range of $\sin(60-\theta) + \sin\theta + 13$ is_____
1) [12,14] 2) [3,13] 3) [-13,-3] 4) [-1,1]

31. Minimum value of $\sin(60+\theta) + \cos(60+\theta)$ is _____
1)$-2+\sqrt{3}$ 2) $\sqrt{3}+2$ 3) $-\sqrt{(2+\sqrt{3})}$ 4) $\sqrt{\sqrt{3}+2}$

32. Maximum value of $\sin^4 x + co^4 x$ is _____
1)1 2) 1/2 3)-1 4) -1/2

33. Maximum value of $\dfrac{1}{\sqrt{7}\sin x + \sqrt{29}\cos x + 7}$ is _____
1)1 2) 7 3)13 4) 29

34. Match the following:

List -I	List – II
1. Period of $\cos\sqrt{x}$	a. $\pi/2$
2. Period of $\sin x + \cos x$	b. π
3. Period of $\lvert\sin x\rvert + \lvert\cos x\rvert$	c. 2π
4. Period of $\sin x \cos x$	d. does not exist

1)a,d,b,c 2)d,c,a,b 3)a,b,c,d 4)b,c,d,a

35. A: $2^{\sin\theta}+2^{\cos\theta} \geq 2^{1-1/\sqrt{2}}$ for all values of θ
R: The minimum value of $\sin\theta+\cos\theta$ is $-\sqrt{2}$
1)A is true, R is true and R is correct explanation of A 2)A is true , R is false
3)A is true, R is true and R is not correct explanation of A4)A is false, R is true

36. The minimum value of $3\sin^2 x + 4\cos^2 x$ is
1)3 2)4 3)5 4)0

37. The max.value of $\sin^6 x + \cos^6 x$ is
1)1 2)3/4 3)1/4 4)3/2

38. $\frac{\text{Minimum of } (\sin^2 x+\cos^2 x)}{\text{Maximum of } [\sin^2(3x/2) + \cos^2(3x/2)]}$ =
1)1 2)2 3)5 4)7

39. Max.value of $\sin^4 x + \cos^4 x$ is
1)1 2)1/2 3)1/4 4)1/3

40. The min.value of $\sin^2 x+3+2\sin x$ is
1)0 2)2 3)3 4)6

41. The min.of $\frac{1}{3\sin x-4\cos x+7}$ is
1)1/6 2)1/8 3)1/11 4)1/12

42. Max. value of $2\sin^2 x - \cos 2x$ is
1)1 2)2 3)3 4)5

43. The maximum value of $1-8\sin^2 x \cos^2 x$ is
1)0 2)1 3)-1 4)2

44. Period of $\sin x \sin(120°-x)\sin(120°+x)$ is
1)$\pi/3$ 2)$2\pi/3$ 3)π 4)$\pi/2$

PREVIOUS EAMCET PAPERS PROBLEMS

45. Minimum value of $\sin\theta + \cos\theta$ is _____ (1987)
1) $\sqrt{2}$ 2) $\sqrt{3}$ 3)- $\sqrt{3}$ 4) -$\sqrt{2}$

46. Period of $\sin \pi x/2 + \cos \pi x/3$ is _____ (1990)
1)4 2) 6 3) 12 4) 24

47. In Δ ABC, maximum value of cosA+cosB+cos C=_____ (1991)
1)1/2 2) 3/2 3) 3/4 4) 4/3

48. The range of f(x) = -3Cos $\sqrt{3+x+x^2}$ is
1)[-1,1] 2)[-2,2] 3)[-3,3] 4)[-4,4]
(1991)

49. The period of Sin($\pi x/2$) + 2 Sin($\pi x/3$) – Tan ($\pi x/4$) is
1) 4 2) 6 3)12 4) 8 (1992)

50. Maximum value of $3\cos\theta + 4\sin\theta$ is _____ (1996C)
1)5 2)4 3) 10 4) 3

51. The period of tan (3x+5) is _____ (1997)
1)$2\pi/3$ 2) $\pi/16$ 3) $\pi/3$ 4) π

52. The period of x-[x], where [x] represents the integral part of x, is equal to
1)1/2 2)1 3)1/3 4)2 (1998)

53. The period of $\sin^3 x + \cos^3 x$ is ____ (1999)
1)$\pi/3$ 2) π 3) 2π 4) $2\pi/3$

54. Maximum value of $1+8 \sin^2 x^2 \cos^2 x^2$ is _____ (1999)
1)3 2)-1 3)-8 4)9

55. If $f(x)=\sin^2(\pi/8+x/2)-\sin^2(\pi/8-x/2)$, then the period of f(x) is (2002)
1) π 2) $\pi/2$ 3) $\pi/3$ 4)2π

56. Period of function $f(\theta)=\sin\theta/3+\cos\theta/2$ is _____ (2003)
1)2π 2) 4π 3) 6π 4) 12π

57. If $n \in N$, and the period of $\frac{\cos nx}{\sin(x/n)}$ is 4π, then n=__ (2004)
1)4 2)3 3)2 4)1

58. For $x \in R$, $3\cos(4x-5)+4$ lies in the interval (2004)
1) [1,7] 2)[4,7] 3)[0,7] 4)[2,7]

59. The extreme value of $4\cos(x^2)\cos(\pi/3+x^2)\cos(\pi/3-x^2)$ over R are (2005)
1)-1,1 2)-2,2 3)-3,3 4)-4,4

60. If $5\cos x + 12\cos y = 13$, then the maximum value of $5\sin x + 12\sin y$ is
1)12 2)$\sqrt{120}$ 3)$\sqrt{20}$ 4)13 (2006)

61. For all values of θ, the values of $3-\cos\theta+\cos(\theta+\pi/3)$ lie in the interval
1)[-2,3] 2)[-2,1] 3)[2,4] 4)[1,5] (2006)

62. The period of $\sin^4 x + \cos^4 x$ is: (2009)
1) $\frac{\pi^4}{2}$ 2) $\frac{\pi^2}{2}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{2}$

63. The period of $\left(\tan\theta - \frac{1}{3}\tan^3\theta\right)\left(\frac{1}{3} - \tan^2\theta\right)^{-1}$, where $\tan^2\theta \neq \frac{1}{3}$ is : (2010)
1) $\frac{\pi}{3}$ 2) $\frac{2\pi}{3}$ 3) π 4) 2π

64. If f: $\square \to \square$ is defined by f(x) = 7 + cos(5x + 3) for $x \in \square$, then the period of f is 2011)
1) 2π 2) π 3) $\frac{\pi}{5}$ 4) $\frac{2\pi}{5}$

65. If f(x) = $\sin^6 x + \cos^6 x$ for $x \in \square$, then f(x) lies in the interval (2011)

1) $\left[\frac{7}{8},\frac{5}{4}\right]$ 2) $\left[\frac{1}{2},\frac{5}{8}\right]$ 3) $\left[\frac{1}{4},1\right]$ 4) $\left[\frac{1}{4},\frac{1}{2}\right]$

66. The period of f(x) = $\cos\left(\frac{x}{3}\right)+\sin\left(\frac{x}{2}\right)$ is : (2013)

1) 2π 2) 4π 3) 8π 4) 12π

67. The sum of the solutions in $(0, 2\pi)$ of the equation $\cos x \cos\left(\frac{\pi}{3}-x\right)\cos\left(\frac{\pi}{3}+x\right)=\frac{1}{4}$ is (2014)

1) π 2) 2π 3) 3π 4) 4π

68. The number of solution of secxcos5x + 1 = 0 in the interval $[0, 2\pi]$ is (2015)

1) 5 2) 8 3) 10 4) 12

69. If $\tan\theta.\tan\left(120^0-\theta\right).\tan\left(120^0+\theta\right)=\frac{1}{\sqrt{3}}$, then $\theta =$ (2015 A.P.)

1) $\frac{n\pi}{3}+\frac{\pi}{18}$ 2) $\frac{n\pi}{3}+\frac{\pi}{12}$ 3) $\frac{n\pi}{12}+\frac{\pi}{12}$ 4) $\frac{n\pi}{3}+\frac{\pi}{6}, n \in Z$

70. If A > 0, B > 0 & $A+B=\frac{\pi}{3}$, then the maximum value of tanA tanB is

1) $\frac{1}{\sqrt{3}}$ 2) $\frac{1}{3}$ 3) $\frac{1}{2}$ 4) $\sqrt{3}$

KEY

1) **3**	2) **2**	3) **2**	4) **2**	5) **1**	6) **2**	7) **2**	8) **2**	9) **1**	10) **2**
11) **4**	12) **2**	13) **1**	14) **3**	15) **2**	16) **4**	17) **1**	18) **2**	19) **1**	20) **4**
21) **1**	22) **2**	23) **3**	24) **4**	25) **1**	26) **2**	27) **4**	28) **1**	29) **2**	30) **1**
31) **3**	32) **1**	33) **2**	34) **1**	35) **1**	36) **1**	37) **1**	38) **1**	39) **2**	40) **1**
41) **3**	42) **2**	43) **2**	44) **4**	45) **3**	46) **2**	47) **3**	48) **3**	49) **1**	50) **3**
51) **2**	52) **3**	53) **1**	54) **3**	55) **3**	56) **1**	57) **3**	58) **1**	59) **1**	60) **2**
61) **3**	62) **4**	**63) 1**	**64) 4**	**65) 3**	**66) 4**	**67) 2**	**68) 3**	**69) 1**	**70)2**

AIEEE PROBLEMS

1. The period of $\sin^2 x$ is [2002]

1) π 2) 2π 3) $\pi/2$ 4) 3π

2. The period of $\sin^4 x + \cos^4 x$ is [2002]

1) 2π 2) π 3) $\pi/2$ 4) $\pi/4$

3. If u = $\sqrt{a^2\cos^2\theta + b^2\sin^2\theta} + \sqrt{a^2\sin^2\theta + b^2\cos^2\theta}$ then the difference between the maximum and minimum values of u^2 is given by [2004]

1) $2(a^2+b^2)$ 2) $(a-b)^2$ 3) $(a+b)^2$ 4) $2\sqrt{a^2+b^2}$

KEY

1) **1** 2) **3** 3) 2

Exercise-B

1. The period of 2Sin 3x –3 Cos x +4 is
(1) 2π (2) π (3) 4π (4) $\pi/2$

2. The period of $\frac{2\,Cos\,2x}{3\tan 4x}$ =
(1) π (2) 2π (3) 4π (4) $\pi/2$

3. The period of 10 Cot 6 x +6 Sin 2 x is
(1) π (2) 2π (3) 4π (4) $\pi/2$

4. The period of Cos x Cos (60- x) Cos (60+ x) is
(1) $2\pi/3$ (2) 2π (3) π (4) 4π

5. The period of 2Cos x Sin $\left(\frac{\pi}{4}+x\right)$ is
(1) π (2) 2π (3) 4π (4) $\pi/2$

6. The period of the function $\frac{5\,Sin\,x + 3\,Cosx}{4\,\text{Sin}\,2x - 5\,\text{Cos}\,2x}$ is
(1) π (2) 2π (3) 3π (4) 4π

7. The maximum value of Cos x + Sinx is
(1) 1 (2) $\sqrt{2}$ (3) $\sqrt{3}$ (4) 2

8. The period of $Sin\left(\frac{\pi}{5}x\right) + Cos\left(\frac{\pi}{3}x\right) / Sec\left(\frac{\pi}{6}x\right) + Cot\left(\frac{\pi}{4}x\right)$ is
(1) 30 (2) 40 (3) 50 (4) 60

9. The period of $\frac{Sin\ (nx)}{Cos\ (x/n)}$ is 4π where n is + ve integer then n=
(1) 1 (2) 2 (3) 3 (4) 4

10. The period of $\frac{5\,\text{Cos}\,x - 3\,\text{Sin}\,x}{3\,\text{Sin}\,2x + 4\,Cos2x}$ is

(1) $\pi/2$ (2) π (3) 2π (4) 4π

11. The range of

Cos θ+3 $\sqrt{2}$ Cos $\left(\theta+\frac{\pi}{4}\right)$+ 5 is (a,b) then a+b

(1) 0 (2) 5 (3) 10 (4) 15

12. If Cot (π Cos x) = tan (π Sin x) then Cos (x-π/4) =

(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}$ (3) $\frac{1}{2\sqrt{2}}$ (4) 1

13. The least value of sin2x-√3.cos2x is

1)-2 2)-√3 3)-1 4)0

14. The period of |sinx| is

1)π 2)2π 3)π/2 4)0

15. The function f is given by f(x)= $2\cos\frac{\pi x}{3}+\sin\frac{\pi x}{2}-\tan\frac{\pi x}{4}=$ is period with period

1)6 2)3 3)4 4)12

16. Minimum value of tanθ+cotθ is

1)2 2)-2 3)1/2 4)1

17. Maximum value of $\sin^4x+\cos^4x$ is

1)1 2)1/2 3)1/4 4)-1

18. The period of $\sin^4x+\cos^4x$ is

1)π 2)π/2 3)2π 4)3π

19. The maximum value of 1/(-2sinx+√3cosx+6) is

1) $\frac{\sqrt{7}+6}{29}$ 2) $\frac{\sqrt{7}-26}{29}$ 3) $\frac{\sqrt{5}-64)}{27}$ 4) $\frac{\sqrt{5}+6}{27}$

20. The period of $\frac{5\sin x+3\cos x}{4\sin 2x-5\cos 2x}$

1)π 2)π/2 3)2π 4)3π

21. If √3cosθ -sinθ =1 then θ =

1)π 2)π/2 3)π/3 4)π/6

22. If 1+sinθ +$\sin^2\theta$ +….. to ∞=4+2√3. where 0<θ< π then θ=

1)$\pi/6,\pi/3$ 2)$\pi/3,5\pi/6$ 3)$\pi/6,2\pi3$ 4)$\pi/3,2\pi/3$

23. If $\sqrt{\sin x} + \cos x=0$ then $\sin x =$
1) $\frac{\sqrt{5}+1}{2}$ 2) $\frac{\sqrt{5}+1}{8}$ 3) $\frac{\sqrt{5}-1}{8}$ 4) $\frac{\sqrt{5}-1}{2}$

24. The general solution of $\sin^2x-2\cos x+1/4=0$ is
1)$2n\pi\pm\pi/2$ 2)$n\pi\pm\pi/2$ 3)$2n\pi\pm\pi/3$ 4) $n\pi\pm\pi/3$

25. the most general value of θ satisfying $\sin\theta=-1/2$, $\tan\theta=1/\sqrt{3}$ is
1))$2n\pi+7\pi/6$ 2)$n\pi-7\pi/2$ 3)$n\pi-5\pi/6$ 4)$n\pi+-5\pi/6$

26. $\sin[\sin^{-1}1/2 +\cos^{-1}1/2]=$
1)$\pi6$ 2)$\pi/3$ 3)$\pi/2$ 4)1

27. $\mathrm{Tan}[\cos^{-1}4/5+\mathrm{Tan}^{-1}2/3]=$
1)11/6 2)15/6 3)17/6 4)1/2

28. The principle value of $\sin^{-1}(\sin2\pi/3)$ is
1)$-2\pi/3$ 2)$2\pi/3$ 3)$4\pi/3$ 4)none

29. $\mathrm{Tan}^{-1}2+\mathrm{Tan}^{-1}3=$
1)$\pi/4$ 2)$3\pi/4$ 3)$-\pi/4$ 4)$-3\pi/4$

30. $\mathrm{Sin}[\mathrm{Tan}^{-1}\frac{1-x^2}{2x}+\cos^{-1}\frac{1-x^2}{1+x^2}]$
1)0 2)1 3)$1/\sqrt{2}$ 4)$\sqrt{2}$

31. $\sin(\mathrm{Tan}^{-1}3/5) =$
1)4/5 2)5/4 3)$3/\sqrt{34}$ 4)$5/\sqrt{31}$

32. $\cos(\mathrm{Tan}^{-1}\sin(\cot^{-1}x)) =$
1)$(x^2+2/x^2+3)^{1/2}$ 2)$(x^3+3/x^2+4)^{1/2}$ 3)$(x^2+1/x^2+2)^{1/2}$ 4)x

33. $\cos^{-1}(-\cos\pi/8) =$
1)$\pi/8$ 2)7π 3)$\pi/7$ 4)0

34. $\sin[\pi/3-\sin^{-1}(-1/2)]=$
1)1/2 2)2 3)1 4)1/3

35. $\cos[2\tan^{-1}1/7]=$
1)24/25 2)24/27 3)23/25 4)22/25

36. $2\ \mathrm{Tan}^{-1}1/3+\mathrm{Tan}-11/7=$
1)$\pi/2$ 2)$\pi/3$ 3)$\pi/4$ 4)$\pi/8$

37. The value of $\cosh^{-1}(1)$ is

1)log(√2+1) 2)log(√2-1) 3)1 4)0

38. If $\sinh^{-1}x=\log(5+\sqrt{26})$ then x
1)6 2)5 3)3 4)20

39. sinh0=
1)1 2)0 3)1 4)2

40. If x= log cot(π/4+θ) then sinhx=
1)Tanθ 2)-Tanθ 3)-Tan2θ 4)Tan2θ

41. cosh 2+sinh 2 =
1)3 2)e/2 3)e^2 4)$e^2/2$

42. If x= $\tanh^{-1}y$. Then log(1+y/1-y)=
1)x 2)4x 3)2x 4)3x

KEY

1) 1	2) 1	3) 1	4) 1	5) 1	6) 2	7) 2	8) 4	9)	10) 3
11) 3	12)	13) 1	14) 1	15) 2	16) 1	17) 1	18) 2	19) 1	20) 3
21) 4	22) 4	23) 4	24) 3	25) 1	26) 4	27) 3	28) 4	29) 2	30) 1
31) 3	32) 3	33)	34) 3	35) 1	36) 3	37) 4	38) 2	39) 2	40) 3
41) 3	42) 3								

11. GENERAL SOLUTIONS OF TRIGONOMETRIC EQUATIONS

1. An equation involving trigonometric function is called a trigonometric equation.

2. A value of the unknown angle satisfying the given equation is called the solution of the equation.

3. The set of all such values of x, which satisfy a trigonometric equation is called general solution or solution set.

4. If $\sin\theta = 0$ then G.S is $\theta = n\pi$

5. If $\cos\theta = 0$ then G.S is $\theta = (2n+1)\pi/2$ or $\theta = 2n\pi \pm \pi/2$ or $\theta = n\pi \pm \pi/2$

6. If $\tan\theta = 0$ then G.S is $\theta = n\Pi$

7. If $\cot\theta = 0$ then G.S is $\theta = (2n+1)\pi/2$

8. $\sec\theta = 0$ has no solution

9. $\operatorname{cosec}\theta = 0$ has no solution

10. If $\sin\theta = \sin\alpha$ then $\theta = n\pi + (-1)^n\alpha$

11. If $\cos\theta = \cos\alpha$ then $\theta = 2n\pi \pm \alpha$

12. If $\tan\theta = \tan\alpha$ then $\theta = n\pi + \alpha$

13. If $\sin\theta = \sin\alpha$ and $\cos\theta = \cos\alpha$ then G. S in $\theta = 2n\pi + \alpha$ if solved simultaneously $(0 \le \alpha \le 2\pi)$

14. If $\sin^2\theta = \sin^2\alpha$ then $\theta = n\pi \pm \alpha$

15. If $\cos^2\theta = \cos^2\alpha$ then $\theta = n\pi \pm \alpha$

16. If $\tan^2\theta = \tan^2\alpha$ then $\theta = n\pi \pm \alpha$

17. If $\sin\theta = k$ then the value of θ which satisfy the equation is called principal value. $-1 \le k \le 1$ and $\theta \in [-\pi/2, \pi/2]$

18. If $\cos\theta = k$ then the value of θ which satisfy the equation is called principal value. $1 \le k \le 1$ and $\theta \in [0, \pi]$

19. If $\tan\theta = k$ then the value of θ which satisfy the equation is called principal value. $K \in R$ and $\theta \in (-\pi/2, \pi/2)$

20. The G.S of acosθ+bsinθ=c is $\theta = 2n\pi \pm \cos^{-1}\left(\frac{c}{\sqrt{a^2+b^2}}\right) + \tan^{-1}\left(\frac{b}{a}\right)$

Exercise-A

Write the general solution:

1. Sin θ + √3 cos θ= √2
   1) θ =nπ+(-1)^n π/4-π/3 2) θ =2nπ+π/6± π/6 3) θ =2nπ-π/6 4) θ =2 nπ± π/3

2. 3 secA = 4 cos A then A=___
   1)2nπ± π/6 2) nπ± π/6 3) 2nπ± 5π/6 4) nπ±5π/6

3. tan^2 θ = sin^2 π/2 then θ=___
   1)nπ 2) nπ± π/8 3) nπ± π/6 4) nπ±π/4

4. √3 (tan θ+cot θ) =4
   1) nπ/2 +(-1) ^{n} π/6 2) nπ/2 3) nπ/2 ± π/6 4) nπ/2± π/2

5. sin θ = 1/2, tan θ= 1/√3
   1) 2nπ± π/3 2) 2nπ+π/6 3) nπ+π/3 4) nπ/2 + π/2

6. cos θ = -1/√2 and tan θ=1
   1)2nπ+ 5π/4 2) 2nπ± π/4 3) nπ±π/4 4) nπ± 5π/4

7. 81 sin^2 x + 81 cos^2 x =30, x=_____
   1) π/2 2) π/3 3) π/4 4) π/6

8. √3 cos θ- sinθ=1 then the value of θ is _____
   1)π 2) π/3 3) π/6 4) 2π/6

9. cos θ + cos 2 θ+ cos 3θ =0
   1)(4n±1) π/4 2) (4n±1) π/2 3) 2nπ±π/2 4) 2nπ±π/4

10. cos θ=1/2 , tan θ=-√3
    1)2nπ 2) 2nπ+π/6 3) 2nπ - π/6 4) π/6

11. sinθ =-1/2 , tanθ=1/√3
    1)2nπ± 5π/6 2) 2nπ± 7π/6 3) 2nπ± 9π/6 4) 2nπ± 3π/6

12. If tan(π/4 +θ)+tan(π/4-θ) =4 then θ=___

1)$n\pi \pm \pi$ 2) $n\pi \pm \pi/3$ 3) $n\pi \pm \pi/6$ 4) $n\pi \pm \pi/4$

13. $\tan^2\theta+\cot^2\theta = 2$ then θ=___
1) $n\pi \pm \pi/4$ 2) $n\pi \pm \pi/3$ 3) $2n\pi \pm \pi/4$ 4) $2n\pi \pm \pi/3$

14. $2 \sin 2x - \sin x = 0$ then n=___
1)$2n\pi \pm 1/4$ 2) $2n\pi \pm 1/2$ 3) $2n\pi \pm \cos^{-1}(1/4)$ 4) $2n\pi \pm \cos^{-1}(1/2)$

15. $\sin\theta = 1/\sqrt{2}$, $\cos\theta = -1/\sqrt{2}$
1)$2n\pi+\pi/4$ 2) $2n\pi+3\pi/4$ 3) $n\pi+3\pi/4$ 4) $n\pi+\pi/4$

16. $\tan(\pi/4 \sin\theta) = \cot(\pi/4\cos\theta)$ then G.S.=_____
1) $n\pi+(-1)^n \pi/4 - \pi/4$ 2) $n\pi \pm \pi/4$ 3) $2n\pi \pm \pi/4$
4) $n\pi+(-1)^n \pi/4 + \pi/4$

17. $\sin\theta + \sin 3\theta = 0$
1)$\theta = n\pi/2$ or $(2n+1)\pi/2$ 2) $\theta = 2n\pi$ or $(2n-1)\pi/2$
3) $\theta = 2n\pi$ or $n\pi/2$ 4) $\theta = n\pi/2$ or $2n\pi/4$

18. $\tan 2\theta \tan\theta = 1$ then G.S=___
1)$2n\pi/3 \pm \pi/6$ 2) $2n\pi \pm \pi/3$ 3) $2n\pi \pm \pi/6$ 4) $n\pi \pm \pi/6$

19. $\sin(x+10^0) = \cos(3x-68^0)$ and x is acute ,x=___
1)35^0 2) 37^0 3) 39^0 4) 45^0

20. solve $\cos 2\theta = \sqrt{[10+2\sqrt{5}]}/4$
1) $n\pi \pm \pi/20$ 2) $n\pi \pm \pi/10$ 3) $n\pi \pm 2\pi/3$ 4) $n\pi \pm \pi/3$

21. $\sin(\theta/2) = -1$, G.S=___
1)$2n\pi \pm \pi$ 2) $2n\pi+(-1)^{n+1}\pi$ 3) $2n\pi+(-1)^n\pi$ 4) $2n\pi+\pi/2$

22. $7\sin^2\theta + 3\cos^2\theta = 4$,G.S=_____
1)$n\pi \pm \pi/3$ 2) $n\pi \pm \pi/6$ 3) $n\pi \pm 2\pi/3$ 4) $2n\pi \pm \pi/6$

23. $\sqrt{3}\,\mathrm{cosec}\, 2\theta = 2$,G.S=_____
1)$n\pi/2+(-1)^n \pi/6$ 2)$n\pi/2$ 3)$2n\pi+\pi/2$ 4) $n\pi+\pi/2$

24. $2\sin^2 A = \sin A$ for $0 \le A < 180$ then values of A are_____
1) $0^0, 30^0, 150^0$ 2) $60^0, 90^0, 45^0$ 3) 0^0 4) 30^0

25. $(1-\tan\theta)(\sqrt{3}-\tan\theta) = 0$
1) $\theta = n\pi+\pi/4$ or $n\pi+\pi/3$ 2) $\theta = 2n\pi$ or $n\pi$ 3) $\theta = n\pi+\pi/4$ or $2n\pi$ 4)$\theta = n\pi-\pi/4$

26. $2\cos^2\theta - \sqrt{3}\sin\theta+1=0$ then G.S=_____

1)$n\pi\pm(-1)^n\pi$ 2) $n\pi+(-1)^n\pi/3$

3) $2n\pi+(-1)^n\pi/3$ 4) $2n\pi+(-1)^n\pi/2$

27. $\sin2\theta = \cos3\theta$ for $0\le\theta\le360^0$, θ =_____

1)$18^0, 90^0, 162^0, 234^0, 270^0, 306^0$ 2) $15^0,45^0,80^0,210^0,260^0,326^0$

3) $0^0, 15^0,25^0,62^0$ 4) 35^0

28. Find the no.of solutions of the equation $\tan x+\sec x=2\cos x$, $\cos x\neq0$ is $[0,2\pi]$

1) 1 2) 2 3)3 4) no solution

Write the G.S:

29. $10\sin^2 x+10\sin\cos x-\cos^2 x=2$

1)$n\pi$ 2) $n\pi+\tan^{-1}(-3/2)$ 3) $n\pi\pm3/2$ 4) $2n\pi+\tan^{-1}(-3/2)$

30. $\sin3\alpha = 4\sin\alpha\sin(x+\alpha)\sin(x-\alpha)$

1) $n\pi\pm\pi$ 2) $n\pi\pm2\pi/3$ 3) $n\pi\pm\pi/3$ 4) $n\pi\pm\pi/6$

31. $\tan\theta+\sec\theta=\sqrt{3}$,G.S=_____

1)$2n\pi\pm\pi$ 2) $2n\pi-\pi/6$ 3) $2n\pi-\pi/2$ 4) $2n\pi+\pi/6$

32. $\sin6\theta+\sin4\theta+\sin2\theta=0$

1)$n\pi$ 2) $n\pi\pm\pi/4$ 3) $n\pi\pm\pi/6$ 4) $2n\pi\pm\pi/3$

33. $3\tan^4\alpha - 10\tan^2\alpha+3=0$

1)$\{n\pi+\pi/3\}\cup(n\pi)$, $n\in z$ 2) $\{n\pi\pm\pi/4\}\cup(n\pi)$, $n\in z$

3) $\{n\pi\pm\pi/3\}\cup\{n\pi\pm\pi/6\}$ $n\in z$. 4) $\{n\pi\pm\pi/6\}\cup\{n\pi\pm\pi/4\}$, $n\in z$

Write the G.S:

34. $\tan2x = \cot3x$

1)$(2n+1)\pi$ 2) $(2n+1)\pi/6$ 3) $(2n+1)\pi/10$ 4) $(2n+1)\pi/3$

35. $\sin\theta = \cos2\theta$

1) $n\pi+(-1)^n(\pi/2-2\theta)$ 2) $n\pi\pm\pi/2$ 3) $n\pi+(-1)^{n+1}(\pi/2-2\theta)$

4) $n\pi+(-1)^n(\pi/2+2\theta)$

36. $\cos\theta+\sin\theta=\sqrt{2}$

1) $n\pi+(-1)^n\pi/2$ 2) $n\pi+(-1)^n\pi/2-\pi/4$ 3) $n\pi+(-1)n\pi/4$

4) $n\pi+(-1)^n\pi/2+\pi/4$

37. $\cos\theta+(2+\sqrt{3})\sin\theta=1$

1) $\theta = n\pi+(-1)^n 15^0-15^0$ 2) $\theta=n\pi+(-1)^n 15^0$ 3) $\theta =2 n\pi+(-)^n 15^0$ 4) $\theta=2n$

38. Match the following.

List-I	List-II
I)Cosx= -1/2	a)x=7π/3
II)Sinx=√3/2	b)x=7π/6
III)Tanx=1/√3	c)x=8π /3
IV)Cotx=1	d) x=3π /4
	e) x=5π /4

1)b,d,c,a 2)c,a,b,e 3)b,c,e,a 4)b,e,c,a

39. A: The general solution of sinx=-1 is $n\pi+(-1)^n 3\pi /2$
R: The principle value of Sinx lies in [- π/2, π/2]
1)A is true, R is false 2)A is false, R is true
3)A is true, R is true, R ⇒A 4)A is false, R is false

PREVIOUS EAMCET PAPER PROBLEMS

40. $\sin^2 x - 2\cos x + 1/4=0$ is _____ (1986)
1) $2n\pi \pm \pi/3$ 2) $2n\pi$ 3) $n\pi$ 4) $(n+1) 2 \pi$

41. $7\sin^2 x +3 \cos^2 x=4$ [1986]
1)$n \pi\pm \pi/2$ 2) $n\pi\pm \pi/6$ 3) $2n\pi\pm \pi/2$ 4) $2n\pi\pm \pi/6$

42. If α,β are different values of x satisfying acos x + bsin x =c then tan (α+ β/ 2) = ___ [1986]
1)b/a 2) a/b 3) ab 4) √ab

43. All values of x satisfying sin2x+sin4x=2sin3x are _____ [1989]
1)nπ/3 2)2nπ 3) nπ 4) nπ +π/3

44. The values of θ satisfying sin7θ=sin4θ - sinθ and 0<θ <π/2 [1990]
1) π/4, π/6 2) π/4, 2π/3 3) π/4, π/9 4) π/4, 2π/9

45. 3tan(θ-15)= tan (θ+15), 0<θ<π [1993]
1) π/4 2)- π/4 3) 2π 4) π/2

46. The values of θ (0<θ<360) satisfying cosec θ + 2=0 are _____ [1994]
1)7π/6, 5π/6 2) 5π/3, π/3 3) 5π/3, 2π/3 4) 7π/6, 11π/6

47. If a is any real number, the number of roots of cotx-tanx=a in the first quadrant [1995]
1) No roots 2) 2 roots 3)1 root 4) 3 roots

48. Smallest value of θ satisfying $\sqrt{3}(\cot\theta+\tan\theta)=4$ is____ [1995]
1) $\pi/4$ 2) $\pi/6$ 3) $\pi/2$ 4) π

49. $\sqrt{3}\cos\theta - \sin\theta=1$ then θ=_____ (1996)
1) π 2) $\pi/2$ 3) $\pi/3$ 4) $\pi/6$

50. The no. of roots of the equation $2\sin^2\theta + 3\sin\theta+1=0$ in $(0, 2\pi)$ is___ (1996)
1)1 2) 2 3)3 4) 4

51. The G.S. in x for the equation $9^{\cos x} - 2.3^{\cos x}+1=0$ is _____ (1996)
1)$2n\pm\pi/2$ 2) $(2n+1)\pi/2$ 3) $(2n+1)\pi/3$ 4) $(n+1)\pi/2$

52. $\sqrt{3}\cos\theta + \sin\theta=\sqrt{2}$ [1996c]
1)$\theta = 2n\pi \pm \pi/4+\pi/6$ 2) $\theta=n\pi+(-1)^n\pi/3-\pi/4$
3) $\theta=n\pi+(-1)^n\pi/4-\pi/6$ 4) $\theta=n\pi+(-1)^n\pi/6-\pi/4$

53. The values of θ satisfying $\sin5\theta = \sin3\theta - \sin\theta$ and $0<\theta<\pi/2$ are ___ [1997]
1) $\pi/3$, $\pi/6$ 2) $\pi/3$, $\pi/4$ 3) $2\pi/3$, $\pi/4$ 4) $\pi/3$, $2\pi/6$

54. If $1+\sin\theta+\sin^2\theta+\ldots$ to $\infty = 4+2\sqrt{3}$ when $0<\theta<\pi$, $(\theta\neq\pi/2)$ then θ=____ [1997]
1) $\pi/6$, $\pi/4$ 2) $\pi/4$, $5\pi/6$ 3) $2\pi/5$, $\pi/6$ 4) $\pi/3$, $2\pi/3$

55. If $\sqrt{\sin x}+\cos x=0$ then sinx=_____ [1998]
1) $(\sqrt{5}+1)/2$ 2) $(\sqrt{5}-1)/2$ 3) $(1-\sqrt{5})/2$ 4) $(-1-\sqrt{5})/2$

56. If $\tan\theta+\sec\theta=\sqrt{3}$, then the principal value of $\theta+\pi/6$ is [2000]
1) $\pi/4$ 2) $\pi/3$ 3)$2\pi/3$ 4) $3\pi/4$

57. If $\tan\theta+\cot\theta=2$, then $\sin\theta$= [2001]
1)$\pm1/\sqrt{2}$ 2)$\pm1/\sqrt{3}$ 3)$\pm1/2$ 4)±1

58. The equation $\sqrt{3}\sin x+\cos x=4$ has [2001]
1)only one solution 2)two solutions
3)infinitely many solutions 4)no solutions

59. The solution set of $(5+4\cos\theta)(2\cos\theta+1)=0$ in the interval $[0,2\pi]$ is [2003]
1) $\{\pi/3, 2\pi/3\}$ 2)$\{\pi/3, \pi\}$ 3)$\{2\pi/3,4\pi/3\}$ 4)$\{2\pi/3,5\pi/3\}$

60. If $\begin{vmatrix} \cos(A+B) & -\sin(A+B) & \cos2B \\ \sin A & \cos A & \sin B \\ -\cos A & \sin A & \cos B \end{vmatrix} = 0$ then B = (2003)

1)(2n+1)π/2 2)nπ 3)(2n+1)π 4)2nπ

61. cos -4sin =1 sin + 4cos =____ (2005)
1) ±1 2)0 3) ±2 4) ±4

62. cos 2x =(√2+1) (cosx-1/√2), cosx ≠ 1 / 2 ⇒ x∈ (2005)
1){2nπ±π/3:n∈z} 2){2nπ±π/6:n∈z} 3){2nπ±π/2:n∈z} 4){2nπ±π/4:n∈z}

63. If x∈(-π,π) such that y = $1+|\cos x|+|\cos x^2|+|\cos x^3|+....$ and $8^y = 64$ then y = (2007)
1)1 2)2 3)3 4)4

64. $\{x \in R : \cos 2x + 2\cos^2 x - 2 = 0\} =$ (2008)
1)$\{2n\pi + \frac{\pi}{3} : n \in Z\}$ 2)$\{n\pi \pm \frac{\pi}{6} : n \in Z\}$ 3) $\{\pi \pm \frac{\pi}{3} : n \in Z\}$ 4) $\{2n\pi - \frac{\pi}{3} : n \in Z\}$

65. If 3 cos x ≠ 2 sin x, then the general solution of $\sin^2 x - \cos 2x = 2 - \sin 2x$ is x = (2009)

1) $n\pi + (-1)^n \frac{\pi}{2}, n \in Z$
2) $\frac{n\pi}{2}, n \in Z$
3) $(4n \pm 1)\frac{\pi}{2}, n \in Z$
4) $(2n - 1)\pi, n \in Z$

66. The set of solutions of the equation $\left(\sqrt{3}-1\right)\sin\theta + \left(\sqrt{3}+1\right)\cos\theta = 2$ is

1) $\left\{2n\pi \pm \frac{\pi}{4} + \frac{\pi}{12}; n \in z\right\}$
2) $\left\{2n\pi \pm \frac{\pi}{4} - \frac{\pi}{12}; n \in z\right\}$
3) $\left\{n\pi + (-1)^n \frac{\pi}{4} + \frac{\pi}{12}; n \in z\right\}$
4) $\left\{n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{12}; n \in z\right\}$

67. The most general value of θ which satisfies both the equations $\tan\theta = -1$ and $\cos\theta = \frac{1}{\sqrt{2}}$ is (2011)

1) $n\pi + 7\frac{\pi}{4}$
2) $2n\pi + \frac{7\pi}{4}$
3) $2n\pi + (-1)^n \frac{7\pi}{4}$
4) $\frac{7n\pi}{4}$

68. $3\sin x + 4\cos x = 5 \Rightarrow 6\tan\frac{x}{2} - 9\tan^2\frac{x}{2} =$ (2012)

1) 0
2) 1
3) 3
4) 4

69. If $\tan(\pi\cos\theta) = \cot(\pi\sin\theta)$ then a value of $\cos\left(\theta - \frac{\pi}{4}\right)$ among the following is: (2013)

1) $\frac{1}{2\sqrt{2}}$ 2) $\frac{1}{\sqrt{2}}$ 3) $\frac{1}{2}$ 4) $\frac{1}{4}$

70. The set of solutions of the system of equations: x + 2y = $\frac{2\pi}{3}$ & cosx + cosy = $\frac{3}{2}$ where x, y are real, is (2013)

1) $\left\{(x,y):\cos\left(\frac{x-y}{2}\right)=\frac{1}{2}\right\}$ 2) $\left\{(x,y):\sin\left(\frac{x-y}{2}\right)=\frac{1}{2}\right\}$

3) $\left\{(x,y):\cos(x-y)=\frac{1}{2}\right\}$ 4) Empty set

71. If x > 0, y > 0, z > 0, xy + yz + zx = 1 & if $\tan^{-1}x + \tan^{-1} y + \tan^{-1} z = \pi$ then x + y + z = (2014)

1) xyz 2) 3xyz 3) $\sqrt{xyz}$ 4) 0

72. If $cos\left(cot^{-1}\left(\frac{1}{2}\right)\right)=cot\left(cos^{-1}x\right)$ then a value of x is (2015)

1) $\frac{1}{\sqrt{6}}$ 2) $\frac{-1}{\sqrt{12}}$ 3) $\frac{2}{\sqrt{6}}$ 4) $\frac{-2}{\sqrt{6}}$

73. If $sin^{-1}\left(x-\frac{x^2}{2}+\frac{x^3}{4}+.....\infty\right)+cos^{-1}\left(x^2-\frac{x^4}{4}-.....\infty\right)=\frac{\pi}{2}$ & $0 < x < \sqrt{2}$ then x = (2015 A.P.)

1) 1/2 2) 1 3) -1/2 4) -1

74. If f(x) = $\cos^2$ x + $\cos^2$ 2x + $\cos^2$3x, then the number of values of x ϵ [0, 2π] for which f(x) = 1 is (2016)

1) 4 2) 6 3) 8 4) 10

75. If $\frac{1}{6}\sin\theta, \cos\theta$ & $\tan\theta$ are in geometric progression, then the solution set of θ is (2016AP)

1) $2n\pi \pm\left(\frac{\pi}{6}\right)$ 2) $2n\pi \pm\left(\frac{\pi}{3}\right)$ 3) $n\pi+(-1)^n\left(\frac{\pi}{3}\right)$ 4) $n\pi+\left(\frac{\pi}{3}\right)$

76. The number of solutions of $\cos 2\theta = \sin\theta$ in $(0,2\pi)$ is (2017)

1) 4 2) 3 3) 2 4) 5

77. $1+\cos^2\theta = 3\sin\theta\cos\theta \Rightarrow \theta =$ (2017AP)

1) $n\pi+\frac{\pi}{4}, n\pi - Tan^{-1}\left(\frac{1}{2}\right); n\in Z$ 2) $n\pi-\frac{\pi}{4}, n\pi + Tan^{-1}(2); n\in Z$

3) $n\pi+\frac{\pi}{4}, n\pi + Tan^{-1}(2); n\in Z$ 4) $n\pi-\frac{\pi}{4}, n\pi + Tan^{-1}\left(\frac{1}{2}\right); n\in Z$

KEY

1) **1**	2) **1**	3) **4**	4) **1**	5) **2**	6) **1**	7) **4**	8) **3**	9) **1**	10) **3**
11) **1**	12) **2**	13) **3**	14) **3**	15) **2**	16) **1**	17) **1**	18) **1**	19) **2**	20) **1**
21) **2**	22) **2**	23) **1**	24) **1**	25) **1**	26) **2**	27) **12**	28) **2**	29) **3**	30) **4**
31) **3**	32) **3**	33) **3**	34) **1**	35) **2**	36) **2**	37) **2**	38) **2**	39) **2**	40) **1**
41) **2**	42) **1**	43) **2**	44) **3**	45) **1**	46) **4**	47) **3**	48) **2**	49) **4**	50) **3**
51) **2**	52) **1**	53) **1**	54) **4**	55) **2**	56) **2**	57) **1**	58) **4**	59) **3**	60) **1**
61) **3**	62) **3**	63) **2**	64) 2	65) **3**	66) **1**	67) **2**	68) **2**	69) **1**	70) **4**
71) **1**	72) **1**	73) **2**	74) 4	75) **2**	76) **2**	77) **3**	78)	79)	

Exercise-B

1. The solution set of the equation $(2\cos x-1)(3+2\cos x)=0$ in $0\leq x\leq 2\pi$ is
   1) $\{\pi/3,\pi/2\}$ 2) $\{\pi/3,5\pi/3\}$ 3) $\{\pi/2,3\pi/2\}$ 4) $\{\pi/2,\pi\}$

2. If $\log_2\sin x-\log_2\cos x-\log_2(1-\tan^2 x)=-1$, then
   1) $\tan x=1/2$ 2) $\tan x=1/3$ 3) $\tan 2x=1$ 4) $\tan 3x=1$

3. For $n\varepsilon Z$, $2\sin^2\theta=\cos 2\theta$ implies $\theta/2=$
   1) $2n\pi\pm\pi/3$ 2) $n\pi\pm\pi/6$ 3) $n\pi/2\pm\pi/12$ 4) $n\pi\pm\pi/12$

4. $\sin A=-1/2$ and $\tan A=1/\sqrt{3}$ imply $A=$
   1) $n\pi+7/6, n\varepsilon Z$ 2) $2n\pi+7\pi/6, n\varepsilon Z$
   3) $n\pi+7\pi/3, n\varepsilon Z$ 4) $2n\pi+7\pi/3, n\varepsilon Z$

5. A solution of the equation $\sin 2x+\cos x-\sin x-\cos 2x=0$ is
   1) $x=n\pi, n\varepsilon Z$ 2) $x=2n\pi, n\varepsilon Z$ 3) $x=n\pi/4, n\varepsilon Z$ 4) $x=n\pi/2, n\varepsilon Z$

6. A solution of the equation $\sqrt{3}\cos\theta+\sin\theta=\sqrt{2}$, for $n\varepsilon Z$, is
   1) $\theta=n\pi+(-1)^n\pi/4-\pi/3$ 2) $)\theta=n\pi+(-1)^n\pi/3-\pi/4$
   3) $\theta=n\pi+(-1)^n\pi/4-\pi/6$ 4) $\theta=n\pi+(-1)^n\pi/6-\pi/4$

7. $\tan 5x=\cot 3x$ implies $x=$
   1) $(2n+1)\pi/4, n\varepsilon Z$ 2) $(2n+1)\pi/8, n\varepsilon Z$
   3) $(2n+1)\pi/16, n\varepsilon Z$ 4) $(2n+1)\pi/32, n\varepsilon Z)$

8. The equation $\sin^2\theta-2\cos\theta+1/4=0$ has the general solution
   1) $\theta=n\pi\pm\pi/6, n\varepsilon Z$ 2) $\theta=2n\pi\pm\pi/6, n\varepsilon Z$ 3) $\theta=n\pi\pm\pi/3, n\varepsilon Z$ 4) $\theta=2n\pi\pm\pi/3, n\varepsilon Z$

9. The values of x, in $0<x<2\pi$, that satisfy $2+\operatorname{cosec} x=0$ are
   1) $7\pi/6, 5\pi/6$ 2) $5\pi/3, \pi/3$ 3) $5\pi/3, 2\pi/3$ 4) $7\pi/6, 11\pi/6$

10. The general solution of $\cos x=-\sqrt{3}/2$ is
    1) $x=2n\pi\pm\pi/3, n\varepsilon Z$ 2) $x=2n\pi\pm\pi/5, n\varepsilon Z$
    3) $x=2n\pi\pm 5\pi/6, n\varepsilon Z$ 4) $x=2n\pi\pm 7\pi/6, n\varepsilon Z$

11. The general solution of $3\cos x=2\sin^2 x$ is

1)$x=2n\pi\pm\pi/6, n\varepsilon Z$ 2)$x=2n\pi\pm\pi/5, n\varepsilon Z$

3)$x=2n\pi\pm\pi/4, n\varepsilon Z$ 4)$x=2n\pi\pm\pi/3, n\varepsilon Z$

12. The number of solutions of the equation $\tan\theta+\sec\theta=2\cos\theta$ in the interval $[0,2\pi]$ is

1)1 2)2 3)3 4)4

13. The general solution of $\tan 3\theta=1$ is

1)$\theta=n\pi/6+\pi/4, n\varepsilon Z$ 2)$\theta=n\pi/3+\pi/12, n\varepsilon Z$

3)$\theta=n\pi+\pi/12, n\varepsilon Z$ 4)$\theta=n\pi/3+\pi/6, n\varepsilon Z$

14. If $\cos\theta+\sin\theta=\sqrt{2}$, then $\sin(\theta+\pi/4)=$

1)1 2)-1 3)-1/2 4)1/2

15. $\cos^2 x=2\cos 2x$ implies $\sin x=$

1)$\pm 1/\sqrt{2}$ 2)$\pm 1/2$ 3)$\pm 1/\sqrt{3}$ 4)$\pm 1/3$

16. If $\cos 2x+\sin 2x=1$, then $x=$

1)$0,\pi/2$ 2)$0,\pi/4$ 3)$\pi/4,\pi/2$ 4)$\pi/3,\pi/6$

17. The number of values of x satisfying the equation $2\sin^2 x+4\cos^2 x=3$ in the interval $(0,2\pi)$ is

1)1 2)2 3)3 4)4

18. $\sin 7x+\sin 3x=\sin 2x+\sin 8x$ implies $x=$

1)$(2n+1), n\varepsilon Z$ 2)$(2n+1)\pi/5, n\varepsilon Z$ 3)$(2n+1)\pi/7, n\varepsilon Z$ 4)$(2n+1)\pi/9, n\varepsilon Z$

19. The general solution of the equation $\sin^2\theta\sec\theta+\sqrt{3}\tan\theta=0$ is

1)$\theta=n\pi+(-1)^{n+1}\pi/3$ 2)$\theta=n\pi$ 3)$\theta=n\pi+(-1)^{n+1}\pi/4$ 4)$\theta=n\pi/6$

20. The solution set of the equation $\sin 2\theta+\sin 4\theta=\sin 3\theta$ for $n\varepsilon Z$ is

1)$n\pi/3$ 2)$n\pi/2$ 3)$n\pi+\pi/3$ 4)$n\pi$

21. The solution of $\sqrt{3}\sin x+\cos x=4$ is

1)No solution 2)$n\pi/2$ 3)$n\pi+\pi/3$ 4)$n\pi$

22. The principle solution of $\tan\theta=-\sqrt{3}$ is

1) $\theta=-\pi/3$ 2)$n\pi/2$ 3)$n\pi+\pi/3$ 4)$n\pi$

23. The values of 'θ' satisfying $\operatorname{cosec}\theta+2=0$ in $(0,2\pi)$ are.

1) $\theta=45^0,30^0$ 2)$\theta=60^0,150^0$ 3)$\theta=30^0,90^0$ 4)$\theta=210^0,330^0$

24. The solution set of $\sqrt{3}\cos\theta=\sin\theta$ is

1)$\theta=\{n\pi+\pi/3; n\varepsilon Z\}$ 2)$\theta=n\pi/6+\pi/4, n\varepsilon Z$

3)$\theta=n\pi+\pi/12, n\varepsilon Z$ 4)$\theta=n\pi/3+\pi/6, n\varepsilon Z$

25. The solution set of $4\sin^2\theta=3$ is

1)$\theta=n\pi/6+\pi/4$, $n\varepsilon Z$ 2)$\theta=n\pi/3+\pi/12$, $n\varepsilon Z$

3) $n\pi\pm\pi/3;n\varepsilon Z$ 4)$\theta=n\pi/3+\pi/6$, $n\varepsilon Z$

26. Solution of $7\sin^2x+3\cos^2x=4$ is

1)$\theta=n\pi/6+\pi/4$, $n\varepsilon Z$ 2)$\theta=n\pi/3+\pi/12$, $n\varepsilon Z$

3) $n\pi\pm\pi/3;n\varepsilon Z$ 4)$\theta=n\pi/3+\pi/6$, $n\varepsilon Z$

27. General solution of $\tan^2\theta=3$

1)$\theta=n\pi/6+\pi/4$, $n\varepsilon Z$ 2)$\theta=n\pi/3+\pi/12$, $n\varepsilon Z$

3) $n\pi\pm\pi/3;n\varepsilon Z$ 4)$\theta=n\pi/3+\pi/6$, $n\varepsilon Z$

28. If $\sqrt{\sin x}+\cos x=0$ then $\sin x=$

1) $\theta=45^0$ 2) $(\sqrt{5}-1)/2$ 3)$\theta=30^0$ 4)$\theta=210^0$

29. Solution ser of $(5+4\cos\theta)(2\cos\theta+1)=0$ in the interval $[0,2\pi]$ is

1) $\theta=\{\pi/3,5\pi/3\}$ 2)$\theta=\{2\pi/3,4\pi/3\}$ 3) $\theta=\{\pi/3,5\pi/\}$ 4) $\theta=\{0,4\pi/3\}$

30. The general solution of $\sin^2x-2\cos x+1/4=0$

1)$x=2n\pi\pm\pi/3$ 2)$x=2n\pi/3$ 3) $x=n\pi/3$ 4) $x=n\pi/4$

31. $\cos\theta+\cos 2\theta+\cos 3\theta=0$

1)$(4n\pm1)\pi/4$ 2) $(4n\pm1)\pi/2$ 3) $2n\pi\pm\pi/2$ 4) $2n\pi\pm\pi/4$

32. $2\cos^2\theta-\sqrt{3}\sin\theta+1=0$ then G.S=

1)$n\pi\pm(-1)^n\pi$ 2) $n\pi+(-1)^n\pi/3$ 3) $2n\pi+(-1)^n\pi/3$ 4) $2n\pi+(-1)^n\pi/2$

33. Find the no.of solutions of the equation $\tan x+\sec x=2\cos x$, $\cos x\neq0$ is $[0,2\pi]$

1) 1 2) 2 3)3 4) no solution

34. $10\sin^2x+10\sin\cos x-\cos^2x=2$

1)$n\pi$ 2) $n\pi+\tan^{-1}(-3/2)$ 3) $n\pi\pm3/2$ 4) $2n\pi+\tan^{-1}(-3./2)$

35. $\tan\theta+\sec\theta=\sqrt{3}$,G.S=

1)$2n\pi\pm\pi$ 2) $2n\pi-\pi/6$ 3) $2n\pi-\pi/2$ 4) $2n\pi+\pi/6$

36. The G.S. of x satisfying $\sin^2x\sec x+\sqrt{3}\tan x=0$ is given by

1) $x=n\pi/2$ 2) $x=n\pi/3$ 3) $x=n\pi$ 4) $x=2n\pi$

37. $2\sin^2\theta=\cos 2\theta$ implies $\frac{\theta}{2}=$

1) $2n\pi\pm\frac{\pi}{3}$ 2) $n\pi\pm\frac{\pi}{6}$ 3) $\frac{n\pi}{2}\pm\frac{\pi}{12}$ 4) $n\pi\pm\frac{\pi}{12}$

38. If $1+\sin^2\theta = 3\sin\theta\cos\theta$ then the sol. Set in $[0, \pi/2]$ is

1) $\left\{\frac{\pi}{4}, \cos^{-1}\left(\frac{1}{3}\right)\right\}$ 2) $\left\{\frac{\pi}{4}, \tan^{-1}\left(\frac{1}{2}\right)\right\}$

3) $\left\{\frac{\pi}{3}, \tan^{-1}\left(\frac{1}{3}\right)\right\}$ 4) $\left\{\frac{\pi}{6}, \sin^{-1}\left(\frac{1}{3}\right)\right\}$

2)

39. If $\sin\theta + \sin 3\theta + \sin 5\theta = 0,\ 0 \le \theta \le \frac{\pi}{2}$ then $\theta =$

1) $0, \pi/3$ 2) $0, \pi/2$ 3) $\pi/4, \pi/2$ 4) $\pi/4, \pi/3$

40. If sinA = sinB & cosA = cosB then A=

1) $2n\pi + B$ 2) $2n\pi - B$ 3) $n\pi + B$ 4) $n\pi + (-1)^n B$

41. If $81^{\sin^2 x} + 81^{\cos^2 x} = 30,\ 0 \le x \le \frac{\pi}{2}$ then x=

1) $\frac{\pi}{4}$ or $\frac{\pi}{2}$ 2) $\frac{\pi}{6}$ or $\frac{\pi}{3}$ 3) $\frac{\pi}{4}$ or $\frac{3\pi}{4}$ 4) $\frac{2\pi}{3}$ or $\frac{3\pi}{4}$

42. If $\tan\theta + \tan 2\theta + \sqrt{3}\tan\theta\tan 2\theta = \sqrt{3}$ then the G.S. is $\theta =$

1) $(3n+1)\frac{\pi}{3}$ 2) $(3n+1)\frac{\pi}{4}$ 3) $(3n+1)\frac{\pi}{6}$ 4) $(2n+1)\frac{\pi}{9}$

43. If $r\sin\theta = 3$ & $r = 4(1+\sin\theta)$ where $o < \theta \le 2\pi$ then $\theta =$

1) $\frac{\pi}{4}, \frac{5\pi}{4}$ 2) $\frac{\pi}{6}, \frac{5\pi}{6}$ 3) $\frac{\pi}{3}, \frac{2\pi}{3}$ 4) $\frac{\pi}{4}, \frac{3\pi}{4}$

44. If $\tan^2\theta = \sqrt{3} + (\sqrt{3}-1)\tan\theta$ & θ lies in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ then $\theta =$

1) $\left\{-\frac{\pi}{3}, -\frac{\pi}{4}\right\}$ 2) $\left\{\frac{\pi}{3}, -\frac{\pi}{4}\right\}$ 3) $\left\{\frac{\pi}{6}, -\frac{\pi}{3}\right\}$ 4) $\left\{-\frac{\pi}{12}, \frac{\pi}{12}\right\}$

45. If $\sin\left(\frac{\pi\cot\theta}{4}\right) = \cos\left(\frac{\pi\tan\theta}{4}\right)$ & θ is in the first quadrant then $\theta =$

1) $\frac{\pi}{3}$ 2) $\frac{\pi}{2}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{6}$

46. If tanpx=cotqx, then the solutions are in A.O with common difference

1) $\frac{\pi}{(p+q)}$ 2) $\frac{2\pi}{(p+q)}$ 3) $\frac{\pi}{(p-q)}$ 4) $\frac{2\pi}{(p-q)}$

47. Find the set of values of x for which $\frac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = 1$

1)2π 2) π/4 3) π/4 4) ϕ

KEY

1) **2**	2) **3**	3) **3**	4) **2**	5) **2**	6) **1**	7) **3**	8) **4**	9) **4**	10) **3**
11) **4**	12) **2**	13) **2**	14) **1**	15) **3**	16) **2**	17) **4**	18) **2**	19) **2**	20) **1**
21) **1**	22) **1**	23) **4**	24) **1**	25) **3**	26) **3**	27) **3**	28) **2**	29) **2**	30) **1**
31) **1**	32) **2**	33) **2**	34) **2**	35) **4**	36) **3**	37) **3**	38) **2**	39) **1**	40) **1**
41) **2**	42) **2**	43) **2**	44) **2**	45) **3**	46) **1**	47) **4**	48)	49)	50)

AIEEE PROBLEMS

1. The trigonometric equation $Sin^{-1} x = 2\ Sin^{-1} a$, has a solution for [2003]

1) $\frac{1}{2} < |a| < \frac{1}{\sqrt{2}}$ 2) all real values of a **3)** $|a| < \frac{1}{\sqrt{2}}$ 4) $|a| \geq \frac{1}{\sqrt{2}}$

KEY: 3

12. INVERSE TRIGNOMETRY

1. $\text{Sin}^{-1}(\sin x) = x \quad -\Pi/2 \le x \le \Pi/2$
2. $\text{Cos}^{-1}(\cos x) = x \quad 0 < x < \Pi$
3. $\text{Tan}^{-1}(\tan x) = x \quad -\Pi/2 < x < \Pi/2$
4. $\text{Cot}^{-1}(\cot x) = x \quad 0 < x < \Pi$
5. $\text{Sec}^{-1}(\sec x) = x \quad x \in [0, \Pi/2) \cup (\Pi/2, \Pi]$
6. $\text{Cosec}^{-1}(\text{cosec} x) = x \quad x \in [-\Pi/2, 0) \cup (0, \Pi/2]$
7. $\text{Sin}(\sin^{-1} x) = x \quad \text{if } -1 \le x \le 1$
8. $\text{Cos}(\cos^{-1} x) = x \quad \text{if } -1 \le x \le 1$
9. $\text{Tan}(\tan^{-1} x) = x \quad \text{if } x \in R$
10. $\text{Cot}(\cot^{-1} x) = x \quad \text{if } x \in R$
11. $\text{Sec}(\sec^{-1} x) = x \quad \text{if } x \in (-\infty, -1] \cup [1, \infty)$
12. $\text{Cosec}(\text{cosec}^{-1} x) = x \quad \text{if } x \in (-\infty, -1] \cup [1, \infty)$
13. $\text{Sin}^{-1}(-x) = -\sin^{-1} x$
14. $\text{Cos}^{-1}(-x) = \Pi - \cos^{-1}(x)$
15. $\text{Tan}^{-1}(-x) = -\text{Tan}^{-1}(x)$
16. $\text{Cot}^{-1}(-x) = \Pi - \cot^{-1} x$
17. $\text{Cosec}^{-1}(-x) = -\text{cosec}^{-1}(x)$
18. $\text{Sec}^{-1}(-x) = \Pi - \text{Sec}^{-1} x$
19. $\text{Sin}^{-1}(x) = \cos^{-1}\sqrt{1-x^2} = \text{Tan}^{-1}[x/(\sqrt{1-x^2})] = \cot^{-1}(\sqrt{1-x^2})/x$
    $= \sec^{-1}[1/(\sqrt{1-x^2})] = \text{cosec}^{-1}(1/x)$ if $0 < x \le 1$
20. $\text{Tan}^{-1}(x) = \sin^{-1}[x/(\sqrt{1+x^2})] = \cos^{-1}[1/(\sqrt{1+x^2})] = \sec^{-1}(\sqrt{1+x^2})$
    $= \text{cosec}^{-1}\frac{\sqrt{1+x^2}}{x} = \cot^{-1}(1/x)$ if $x > 0$
21. $\text{Sin}^{-1}(x) + \cos^{-1}(x) = \Pi/2$, if $-1 \le x \le 1$
22. $\text{Tan}^{-1}(x) + \cot^{-1}(x) = \Pi/2$ if $x \in R$
23. $\text{Sec}^{-1} x + \text{cosec}^{-1} x = \Pi/2$ if $x \in (-\infty, -1) \cup (1, \infty)$
24. $\text{Sin}^{-1}(x) \pm \sin^{-1}(y) = \sin^{-1}[x\sqrt{1-y^2} \pm y\sqrt{1-x^2}]$
25. $\text{Cos}^{-1}(x) \pm \cos^{-1}(y) = \cos^{-1}[xy \pm \sqrt{1-x^2}\sqrt{1-y^2}]$
26. $\text{Tan}^{-1}(x) + \text{Tan}^{-1}(y) = \text{Tan}^{-1}[(x+y)/(1-xy)]$ if $x > 0, y > 0, xy < 1$
27. $\text{Tan}^{-1}(x) + \text{Tan}^{-1}(y) = \Pi + \text{Tan}^{-1}[(x+y)/(1-xy)]$ if $x > 0, y > 0, xy > 1$
28. $\text{Tan}^{-1}(x) + \text{Tan}^{-1}(y) = -\Pi + \text{Tan}^{-1}[(x+y)/(1-xy)]$ if $x < 0, y < 0, xy > 1$
27. $\text{Tan}^{-1}(x) - \text{Tan}^{-1}(y) = \text{Tan}^{-1}[(x-y)/(1+xy)]$ if $x > 0, y > 0$
30. If $\text{Cos}^{-1} x/a + \text{Cos}^{-1} y/b = \alpha$ then $\frac{x^2}{a^2} - \frac{2xy \cos\alpha}{ab} + y^2/b^2 = \text{Sin}^2\alpha$
31. If $\text{Sin}^{-1} x + \sin^{-1} y = \theta$ then $\text{Cos}^{-1} x + \text{Cos}^{-1} y = \pi - \theta$

32. If $\cos^{-1}x+\cos^{-1}y=\theta$ then $\sin^{-1}x+\sin^{-1}y=\pi-\theta$

33. $2\sin^{-1}(x) = \sin^{-1}[2x\sqrt{1-x^2}) = \cos^{-1}(1-2x^2)$

34. $2\cos^{-1}(x) = \cos^{-1}(2x^2-1) = \sin^{-1}[2x\sqrt{1-x^2}]$

35. $2\tan^{-1}(x) = \tan^{-1}[2x/(1-x^2)] = \sin^{-1}[2x/(1+x^2)] = \cos^{-1}(1-x^2)/(1+x^2)]$

36. $3\cos^{-1}(x) = \cos^{-1}(4x^3-3x)$

37. $3\tan^{-1}(x) = \tan^{-1}[(3x-x^3)/(1-3x^2)]$

38. $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \pi/2 \Rightarrow xy+yz+zx=1$

39. $\cot^{-1}x + \cot^{-1}y + \cot^{-1}z = \pi/2 \Rightarrow x+y+z=xyz$

40. $\sin^{-1}x+\sin^{-1}y+\sin^{-1}z=\pi$ then $x\sqrt{1-x^2}+y\sqrt{1-y^2}+z\sqrt{1-z^2}=2xyz$

41. $\cos^{-1}x + \cos^{-1}y + \cos^{-1}z = \pi$ then $x^2+y^2+z^2+2xyz=1$

42. $\tan^{-1}x + \tan^{-1}y+\tan^{-1}z=\pi \Rightarrow x+y+z=xyz$

43. $\cot^{-1}x + \cot^{-1}y + \cot^{-1}z = \pi \Rightarrow xy+yz+zx=1$

44. $\tan^{-1}(x) + \tan^{-1}(y) + \tan^{-1}(z) = \tan^{-1}[(x+y+z-xyz)/(1-xy-yz-zx)]$

45. $1/2\cos^{-1}(x) = \cos^{-1}\sqrt{\frac{1+x}{2}} = \sin^{-1}\sqrt{\frac{1-x}{2}} = \tan^{-1}\sqrt{\frac{1-x}{1+x}}$

46. $\tan(1/2\cos^{-1}x) = \sqrt{\frac{1-x}{1+x}}$

47. $\cos(1/2\cos^{-1}x) = \sqrt{\frac{1+x}{2}}$

48. $\sin(1/2\cos^{-1}x) = \sqrt{\frac{1-x}{2}}$

Exercise-A

Simplify

1. $[\sin(\sec^{-1}13/12)]^2$
   1)25/169 2) 169/144 3) 169/25 4) 144

2. $\cos[\sin^{-1}(24/25)]$
   1) 24/5 2) 25/5 3) 7/25 4) 7/5

3. $\tan^{-1}24/7+\sin^{-1}(x/5) = \pi/2$, x=_____
   1) 24/5 2) 7/5 3) 5/24 4)5/7

4. $\sin^{-1}(3/x) + \cos^{-1}(12/13) = \pi/2$ then x=_____
   1) 12 2) 13 3) 13/4 4) 4/13

5. $\tan^{-1} 12/x + \cot^{-1} 3/4 = \pi/2$, x=_____
1) 12 2) 16 3) 24 4) 4

6. $\tan^{-1} x + \sin^{-1} 3/5 = \pi/2$, x= _____
1) 3/4 2) 4/5 3) 4/3 4)5/4

7. $\tan^{-1} (\sec\theta + \tan\theta) =$_____
1) $\pi/4-\theta$ 2) $\pi/4-\theta/2$ 3)$\pi-\theta/4$ 4))$\pi/4+\theta/2$

8. $\sin^{-1} [2x/(1+x^2)] + \tan^{-1} [2x/(1-x^2)] = \pi$, =x _____
1)1 2) 2 3)-1 4)-2

9. $\sin^{-1} (2x/1+x^2) + \cos^{-1} (1-x^2/1+x^2) = \pi/2$, x=_____
1) $\sqrt{2}+1$ 2) $\sqrt{2}-1$ 3) $1-\sqrt{2}$ 4) $\sqrt{2}$

10. $\sin^{-1} (2x\sqrt{1-x^2}) = \pi/2$, x=_____
1) 1/2 2) 2 3)$1/\sqrt{2}$ 4) $\sqrt{2}$

11. $4\sin^{-1} x + \cos^{-1} x = 3\pi/2$ then x=_____
1) $\sqrt{3}/2$ 2) $\sqrt{3}$ 3) 2 4) $1/\sqrt{3}$

12. $\tan^{-1} 2 + \tan^{-1} 3$=_____
1)$\pi/4$ 2) $3\pi/4$ 3) $\pi/2$ 4) π

13. If $\tan^{-1} 2$ and $\tan^{-1} 3$ are the angles of a triangle then third angle is _____
1) π 2) 2π 3) $\pi/4$ 4) $\pi/2$

14. $\sin^{-1} (3/5) + \tan^{-1} (1/3)$=_____
1) $\text{Tan}^{-1} (3/9)$ 2) $\text{Tan}^{-1} (13/9)$ 3) $\text{Tan}^{-1} (9/13)$ 4) $\text{Tan}^{-1}(3)$

15. $\tan^{-1} (1/5) + \tan^{-1} (1/3) + \tan^{-1}(1/8) =$_____
1) 1/2 2) 3/4 3) 2/3 4) $2\pi/3$

16. $\tan(\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3) =$_____
1) 1 2)2 3)3 4) 0

17. $\tan^{-1} (x/y) - \tan^{-1} [(x-y)/(x+y)] =$_____
1)0 2)$\pi/2$ 3) $\pi/3$ 4)$\pi/4$

18. $\tan^{-1} [m/(m+1)] + \tan^{-1} [1/(2m+1)]$=_____
1) π 2) $\pi/4$ 3) 3 $\pi/4$ 4) $\pi/2$

19. $\sin[\cos^{-1}(1/2)] = x$, x=_____
1)1 2)1 /2 3) $\sqrt{3}/2$ 4) 2

20. Two angles of a triangle are $\cot^{-1}2$ and $\cot^{-1}3$ then the third angle is_____
1)$3\pi/4$ 2) 3π 3) $\pi/4$ 4) $4\pi/3$

21. $\cos^{-1} y/b+\cos^{-1}x/a = \alpha$ then $x^2/a^2+ y^2/b^2$ =_____
1)$\sin^2\alpha$ 2) $(2xy/ab) \cos \alpha$ 3) $\sin^2\alpha +(2xy/ab) \cos \alpha$ 4) $\sin^2\alpha - (2xy/ab)\cos\alpha$

22. $\sin[1/5 \cos^{-1} x] = 1$ then x=____
1) 1 2) 1/2 3) 1/4 4) 0

23. $\tan^{-1} \cot \sin^{-1} \cos x=1$, x=_____
1) 1 2) 2 3)3 4)4

24. $\sin^{-1} \cos \tan^{-1} \cot x= 3/2$, x=_____
1) 1 2) 1/2 3) 3/2 4) 2

25. $\sin \cos^{-1} \tan \cot^{-1} x= \pi/2$, x=_____ ____
1) $\pi^2/4$ 2) $\pi^2 +4$ 3) $2/\sqrt{4-\pi^2}$ 4) $\sqrt{\pi^2+4}$

26. $\cos[\sin^{-1} 4/5 - \cos^{-1} 5/13]$ =____
1)63/65 2) 65/63 3) 13/5 4)5/4

27. $\tan[\tan^{-1} 1/9 + \operatorname{cosec}^{-1} \sqrt{41}/4]$ =___
1) 0 2) 1 3) 3 4) 4

28. $\cos[2 \tan^{-1} 1/7] - \sin[4 \tan^{-1} 1/3]$
1) 1 2) 2 3) 3 4) 0

29. $2 \tan^{-1} [(1-x)/(1+x)] = \cot^{-1} (1/x)$ then x=____
1) 1 2) $1/\sqrt{3}$ 3) $\sqrt{3}$ 4) $2/\sqrt{3}$

30. $\cot^{-1} [(ab+1) / (a-b)] + \cot^{-1} [(bc+1)/(b-c)] + \cot^{-1} [(ca+1) / (c-a)]$=_____
1)1 2) 2 3)-2 4)0

31. $2 \tan^{-1} (\cos x) = \tan^{-1} (2\operatorname{cosec} x)$ then x=____
1) π 2) $\pi/2$ 3) $\pi/4$ 4) $3\pi/4$

32. $[\tan \sin^{-1} (12/13)]^2$=_____
1) 12/25 2) 13/25 3) 25/144 4) 144/25

33. $\tan^{-1} 2x + \tan^{-1}x = \pi/4$, x=____

1) -3/4 2) $(-3+\sqrt{17})/4$ 3) $-3+\sqrt{7}$ 4) $-3-\sqrt{7}$

34. $\tan^{-1} [(\cos\theta + \sin\theta) / (\cos\theta - \sin\theta)]$ = _____

1) $\pi/4 + \theta$ 2) $\pi/4 - \theta/2$ 3) $\pi/4$ 4) θ

35. If $\cos^{-1}x + \cos^{-1}y = 2\pi/3$ then $\sin^{-1}x + \sin^{-1}y$=_____

1) π 2) $2\pi/3$ 3) $\pi/3$ 4) $\pi/2$

36. $\sin^{-1} \left(\frac{1-\sqrt{5}}{4}\right)$=_____

1) 15^0 2) 18^0 3) -18^0 4) -15^0

37. $\tan^{-1}(\tan 585)$ =____

1) π 2) $\pi/2$ 3) $3\pi/4$ 4) $\pi/4$

38. $\tan [1/2 \cos^{-1} (\sqrt{5}/3)]$=____

1) $3+\sqrt{5}$ 2) $3-\sqrt{5}$ 3) $(3-\sqrt{5})/2$ 4) $(3+\sqrt{5})/2$

39. $\cos [\sin^{-1} 3/5 + \sin^{-1} 5/13]$=____

1) 33/65 2) 65/33 3) 169 /75 4) 25/169

40. $\sin [\cos^{-1} (-1/2) + \sin^{-1} (-1/2)]$=____

1) 1 2) 2 3) 1/2 4) -1/2

41. $\sin^{-1} [\sin \{\sin^{-1}\sqrt{3}/2 + 2 \cos^{-1} \sqrt{3}/2\}]$=____

1) π 2) $\pi/3$ 3) $2\pi/3$ 4) $\pi/4$

42. $3 \tan^{-1} \left[\frac{1}{2+\sqrt{3}}\right] \tan^{-1} 1/x = \tan^{-1} (1/3)$, x=_____

1) 1 2) 2 3) 3 4) 4

43. $\tan \left[\frac{\pi}{4} + \frac{1}{2} Cos^{-1}\left(\frac{a}{b}\right)\right] + \left[\tan\frac{\pi}{4} - \frac{1}{2} Cos^{-1}\left(\frac{a}{b}\right) + \right]$ =_____

1) a/b 2) b/a 3) -a/b 4) 2b/a

44. $\cos^{-1} x + \cos^{-1}y + \cos^{-1}z = \pi$, $x^2+y^2+z^2+2xyz$=_____

1) 1 2) 2 3) -2 4) -1

45. $\frac{\tan^2(\tan^{-1}3) + \tan^3(\tan^{-1}5)}{\cot^2(\tan^{-1} 1/5) + \cot^2(\cot^{-1}3)}$ =_____

1) 17/67 2) -17/67 3) 67/17 4) -67/17

46. $\frac{\sin[\sin^{-1} 4/5 + \sin^{-1} 7/25]}{\tan[\tan^{-1} 1/2 + \tan^{-1} 1/3]}$ =_____

1) 117 2) 125/117 3) 117/125 4) -117/125

47. List-I List-II

A) $\sin^{-1}[\sin(2\pi/3)]$ 1) $-\pi/3$

B) $\cos^{-1}[\cos(2\pi/3)]$ 2) $\pi/3$

C) $\tan^{-1}[\tan(2\pi/3)]$ 3) $2\pi/3$

D) $\cot^{-1}[\cot(2\pi/3)]$ 4) $-2\pi/3$

	A	B	C	D
1)	2	3	2	1
2)	2	3	3	1
3)	2	3	2	3
4)	2	3	1	3

48. $\cos^{-1}x \geq \sin^{-1}x, \forall x \in [-1,1]$

R: $\cos^{-1}x$ is decreasing functions $\forall x \in [-1,1]$

1) A is true, R is true and R is correct explanation of A

2) A is true, R is true and R is not correct explanation of A

3) A is true , R is false 4) A is false, R is true

PREVIOUS EAMCET PAPERS PROBLEMS

49. $\sin\{\sin^{-1} 1/2 + \cos^{-1} 1/2\}$=_____ (1985)

1) 1 2) 2 3) 1/2 4) -1/2

50. If $\tan^{-1}(1/7) = \alpha$, $\tan^{-1}(1/3) = \beta$ then $\cos 2\alpha$ =_____ (1986)

1) $\sin 2\beta$ 2) $\sin 4\beta$ 3) $\sin 3\beta$ 4) None

51. If $\sin^{-1}(3/5) + \sin^{-1}(5/13) = \sin^{-1} x$ then x=_____ (1987)

1) 56/65 2) 65/56 3) 169/25 4) 3/13

52. $\tan[\cos^{-1} 4/5 + \tan^{-1} 2/3]$=_____ (1988)

1) 17/6 2) 6/17 3) 4/15 4) 15/4

53. Solution of $\sin^{-1}[2a/(1+a^2)] - \cos^{-1}[(1-b^2)/(1+b^2)] = \tan^{-1}[2x/(1-x^2)]$ is__

1) (a+b)/(1-ab) 2) (a+b)/(1+ab) 3) (a-b)/(1-ab) 4) (a-b)/(1+ab)

(1989)

54. $\cot(\pi/4 - 2\cot^{-1} 3)$=_____ (1992)

1) 1 2) 3 3) 5 4) 7

55. $\tan^{-1} x/y - \tan^{-1} (x-y)/(x+y) =$_____ (1992)
1) $\pi/4$ 2) $\pi/2$ 3) $2\pi/3$ 4) 2π

56. $\tan^{-1} 1/4 + \tan^{-1} 2/9=$_____ (1994)
1)$\tan^{-1}(2)$ 2) $\tan^{-1} (1/2)$ 3) $\tan^{-1} (1)$ 4) $-3\pi/2$

57. If $\sin^{-1} x + \sin^{-1} y = 2\pi/3$ then $\text{Cos}^{-1} x + \cos^{-1} y=$_____ (1994)
1) π 2) $2\pi/3$ 3) $\pi/3$ 4) $\pi/2$

58. Domain of $\sin^{-1} x =$_____ (1995)
1) (-1,1) 2) {-1,1} 3) [-1,1] 4) [1,-1]

59. $\tan^{-1} \sqrt{a(a+b+c) / bc} + \tan^{-1} \sqrt{b(a+b+c) / ac} + \tan^{-1} \sqrt{c(a+b+c) / ab}=$___(1996)
1)2π 2) π 3) $3\pi/4$ 4) $4\pi/3$

60. $\tan^{-1} (x+1) + \tan^{-1} (x-1) = \tan^{-1} (8/31)$ then x=_____ (1996)
1)4 2) 1/4 3) -1/4 4) -4

61. If $\tan^{-1} (1+x) + \tan^{-1} (1-x) = \pi/4$ then x=_____ (1996c)
1)$\sqrt{3}$ 2) $\pm\sqrt{3}$ 3) 2 4)$\pm\sqrt{2}$

62. If $\cos^{-1} 3/5 - \sin^{-1} 4/5 = \cos^{-1} x$ then x= _____ (1997)
1) 2 2)3 3)-2 4)1

63. $\tan[(1/2)\cos^{-1} 0] =$_____ (1997)
1) 1 2)-1 3) 1/2 4)-1/2

64. $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \pi/2$ then 1-xy-yz-zx=_____ (1998)
1) 1 2)2 3)3 4) 0

65. $\tan^{-1} (1/2) + \tan^{-1} (1/3)=$_____ (1999)
1) π 2) $\pi/2$ 3) $\pi/4$ 4) 2π

66. $\tan^{-1} 3 + \tan^{-1} x = \tan^{-1} 8 =$_____ (2000)
1) 5 2) 1/5 3) 2/5 4) 2

67. $\text{Sec}^2 (\tan^{-1} 2) + \text{cosec}^2(\cot^{-1}3) =$_____ (2001)
1) 5 2)10 3) 15 4) –5

68. If $\sin^{-1}x - \cos^{-1}x = \pi/6$, then x= (2002)
1)1/2 2)$\sqrt{3}/2$ 3)-1/2 4)$-\sqrt{3}/2$

69. $\text{Cos} [\cos^{-1} (-1/7)+\sin^{-1} (-1/7)]=$_____ (2003)

1)1 2)2 3) 3 4)0

70. $\sin^{-1}x+\sin^{-1}(1-x)=\cos^{-1}x \Rightarrow x\in$ (2004)

1){1,0} 2){-1,1} 3){0,1/2} 4){2,0}

71. $\sin^{-1}4/5+2\tan^{-1}1/3=$__ (2005)

1)π/3 2)π/4 3)π/2 4)0

72. The value of x where x > 0 and tan Sec^{-1} (1/x) = sin (Tan^{-1}2) is (2007)

1) $\sqrt{5}$ 2) $\sqrt{5}$ /3 3)1 4)2/3

73. If $\sin^{-1}\left(\frac{3}{x}\right)+\sin^{-1}\left(\frac{4}{x}\right)=\frac{\pi}{2}$ then x= (2008)

1)3 2)5 3)7 4)11

74. $\cos^{-1}\left(\frac{-1}{2}\right)-2\sin^{-1}\left(\frac{1}{2}\right)+3\cos^{-1}\left(\frac{-1}{\sqrt{2}}\right)-4\tan^{-1}(-1)=$ **(2009)**

1) $\frac{19\pi}{12}$ 2) $\frac{35\pi}{12}$ 3) $\frac{47\pi}{12}$ **4)** $\frac{43\pi}{12}$

75. $\cos-1\left(\frac{-1}{2}\right)-2\sin^{-1}\left(\frac{1}{2}\right)+3\cos^{-1}\left(\frac{-1}{\sqrt{2}}\right)-4\tan^{-1}(-1)=$

1) $\frac{19\pi}{12}$ 2) $\frac{35\pi}{12}$ 3) $\frac{47\pi}{12}$ 4) $\frac{43\pi}{12}$

76. $\tan^{-1}x+\tan^{-1}y+\tan^{-1}z=\frac{\pi}{2}\Rightarrow 1-xy-yz-zx=$

(2010)

1) 1 2) 0 3) -1 4) 2

77. $\left(\tan^{-1}x\right)^2+\left(\cot^{-1}x\right)^2=\frac{5\pi^2}{8}\Rightarrow x=$

(2011)

1) -1 2) 1 3) 0 4) $\pi\sqrt{\frac{5}{8}}$

78. If $\frac{1}{2}\le x\le 1$ then $\cos^{-1}x+\cos^{-1}\left(\frac{x}{2}+\frac{1}{2}\sqrt{3-3x^2}\right)=$

(2012)

1) $\frac{\pi}{6}$ 2) $\frac{\pi}{3}$ 3) π 4) 0

79. $\cos^{-1}\left(\frac{5}{13}\right)+\cos^{-1}\left(\frac{3}{5}\right)=\cos^{-1}\text{x}\Rightarrow \text{x}=$

(2013)

1) $\frac{3}{65}$ 2) $\frac{-36}{65}$ 3) $\frac{-33}{65}$ 4) -1

81. If x > 0, y > 0, z > 0, xy + yz + zx = 1 & if $\tan^{-1}x + \tan^{-1} y + \tan^{-1} z = \pi$ then x + y + z = (2014)

1) xyz 2) 3xyz 3) $\sqrt{xyz}$ 4) 0

82. If $cos\left(cot^{-1}\left(\frac{1}{2}\right)\right) = cot\left(cos^{-1} x\right)$ then a value of x is (2015)

1) $\frac{1}{\sqrt{6}}$ 2) $\frac{-1}{\sqrt{12}}$ 3) $\frac{2}{\sqrt{6}}$ 4) $\frac{-2}{\sqrt{6}}$

83. If $sin^{-1}\left(x - \frac{x^2}{2} + \frac{x^3}{4} + ...\infty\right) + cos^{-1}\left(x^2 - \frac{x^4}{4} - .....\infty\right) = \frac{\pi}{2}$ & $0 < x < \sqrt{2}$ then x = (2015 A.P.)

1) 1/2 2) 1 3) -1/2 4) -1

84. The value of x which satisfies $\sin(\cot^{-1}x) = \cos(\tan^{-1}(1 + x))$ is (2016)

1) $-\frac{1}{2}$ 2) $\frac{1}{2}$ 3) -1 4) 1

85. If $x = \sin\left(2\tan^{-1} 2\right)$ & $y = \sin\left(\frac{1}{2}\tan^{-1}\frac{4}{3}\right)$, then (2016AP)

1) x > y 2) x = y 3) x = 0 = y 4) x < y

86. $\sin^{-1}\frac{\sqrt{3}}{2} + \sin^{-1}\sqrt{\frac{2}{3}} =$ (2017)

1) $\sin^{-1}\frac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}}$ 2) $\pi - \sin^{-1}\frac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}}$

3) $-\pi - \sin^{-1}\frac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}}$ 4) $\pi + \sin^{-1}\frac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}}$

87. If α, β are the solutions of the equation $\text{Sin}^{-1}x - \text{Cos}^{-1}x = \text{Sin}^{-1}(3x - 2)$ & α > β then 3α+4β= (2017AP)

1) 3 2) 4 3) 5 4) 6

KEY

1) **1**	2) **3**	3) **2**	4) **3**	5) **2**	6) **3**	7) **2**	8) **1**	9) **2**	10) **3**
11) **1**	12) **2**	13) **3**	14) **2**	15) **2**	16) **4**	17) **4**	18) **2**	19) **3**	20) **1**
21) **3**	22) **4**	23) **1**	24) **3**	25) **3**	26) **1**	27) **2**	28) **4**	29) **2**	30) **4**
31) **3**	32) **4**	33) **2**	34) **1**	35) **3**	36) **3**	37) **4**	38) **3**	39) **4**	40) **4**
41) **3**	42) **2**	43) **4**	44) **1**	45) **3**	46) **3**	47) **4**	48) **4**	49) **1**	50) **2**
51) **1**	52) **1**	53) **4**	54) **4**	55) **1**	56) **2**	57) **3**	58) **3**	59) **2**	60) **2**
61) **4**	62) **4**	63) **1**	64) **4**	65) **3**	66) **2**	67) **3**	68) **2**	69) **4**	70) **3**
71) **3**	72) **3**	73) **3**	74) **4**	75) **2**	76) **2**	77) **1**	78) **2**	79) **3**	80) **1**
81) **1**	82) **2**	83) **1**	84) **1**	85) **1**	86) **2**	87) **3**	88)	89)	90)

Exercise-B

1. $\tan^{-1}(1/5) + \tan^{-1}(1/3) + \tan^{-1}(1/8) =$_____
   1) 1/2 2) 3/4 3) 2/3 4) $2\pi/3$

2. $\cos^{-1} y/b+\cos^{-1}x/a = \alpha$ then $x^2/a^2+ y^2/b^2 =$_____
   1) $\sin^2\alpha$ 2) $(2xy/ab) \cos \alpha$ 3) $\sin^2\alpha +(2xy/ab) \cos \alpha$ 4) $\sin^2\alpha -(2xy/ab)\cos\alpha$

3. $\cos [2 \tan^{-1} 1/7] – \sin [4 \tan^{-1} 1/3]$
   1) 1 2) 2 3) 3 4) 0

4. $\tan^{-1}(\tan 585) =$____
   1) π 2) $\pi/2$ 3) $3\pi/4$ 4) $\pi/4$

5. $\tan [1/2 \cos^{-1} (\sqrt{5}/3)]=$____
   1) $3+\sqrt{5}$ 2) $3-\sqrt{5}$ 3) $(3-\sqrt{5})/2$ 4) $(3+\sqrt{5})/2$

6. $\tan\left[\frac{\pi}{4}+\frac{1}{2}Cos^{-1}\left(\frac{a}{b}\right)\right]+\tan\left[\frac{\pi}{4}-\frac{1}{2}Cos^{-1}\left(\frac{a}{b}\right)\right]+ = \; =$_____
   1) a/b 2) b/a 3) -a/b 4) 2b/a

7. $\tan^{-1}\frac{1}{1+(1)(2)}+\tan^{-1}\frac{1}{1+(2)(3)}+\ldots\ldots\ldots\ldots+\tan^{-1}\frac{1}{1+(n-1)(n)}=$
   1) 0 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{2}$ 4) $\tan^{-1}\left(\frac{n-1}{n+1}\right)$

8. $\sin [2\sin^{-1} (0.8)] =$_____
   1) 96 2) 0.96 3) 0.096 4) 0.0096

9. If $a_1, a_2, a_3 \ldots\ldots\ldots\ldots A_n$ are in A.P. with common difference d, then
   $\tan\left[\tan^{-1}\left(\frac{d}{1+a_1a_2}\right)+\tan^{-1}\left(\frac{d}{1+a_2a_3}\right)+\ldots\ldots\ldots\ldots+\tan^{-1}\left(\frac{d}{1+a_{n-1}a_n}\right)\right]=$
   1) $\frac{(n-1)d}{a_1+a_n}$ 2) $\frac{(n-1)d}{1+a_1a_n}$ 3) $\frac{nd}{1+a_1a_n}$ 4) $\frac{a_n-a_1}{a_n+a_1}$

10. If $\cos^{-1}\frac{x}{2}+\cos^{-1}\frac{y}{3}=\theta$ then $9x^2-12xy\cos\theta+4y^2=$
    1) $36\sin^2\theta$ 2) $36\cos^2\theta$ 3) $36\tan^2\theta$ 4) $3\sin\theta$

11. The G.S. of $\sec\theta = \dfrac{\tan^{-1}(1)+\tan^{-1}(2)+\tan^{-1}(3)}{\tan^{-1}(1)+\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{1}{3}\right)}$ is $\theta =$

1) $n\pi+\frac{\pi}{3}$ 2) $2n\pi\pm\frac{\pi}{3}$ 3) $n\pi\pm\frac{\pi}{6}$ 4) $n\pi+\frac{\pi}{4}$

12. Range of $\sin^{-1}x + \cos^{-1}x + \tan^{-1}x$ is

1) $[0,\pi/2]$ 2) $[0,\pi]$ 3) $[\pi/4,3\pi/4]$ 4) $[0,\pi]$

13. If $\tan^{-1}\left(\dfrac{3a^2x-x^3}{a^3-3ax^2}\right) = k\tan^{-1}\left(\dfrac{x}{a}\right)$ then k =

1) 2 2) 3 3) -2 4) 4

14. In a ΔABC, if C is a right angle then $\tan^{-1}\left(\dfrac{a}{b+c}\right)+\tan^{-1}\left(\dfrac{b}{c+a}\right)=$

1) $\pi/3$ 2) $\pi/4$ 3) $\pi/6$ 4) $5\pi/2$

15. $\tan^{-1}\left(\dfrac{yz}{x\sqrt{x^2+y^2+z^2}}\right)+\tan^{-1}\left(\dfrac{zx}{z\sqrt{x^2+y^2+z^2}}\right)+\tan^{-1}\left(\dfrac{xy}{z\sqrt{x^2+y^2+z^2}}\right)=$

1) 0 2) $\pi/2$ 3) $\pi/3$ 4) $\pi/4$

16. If $\sin^{-1}a + \sin^{-1}b + \sin^{-1}c = \pi$ then $a\left(\sqrt{1-a^2}\right)+b\left(\sqrt{1-b^2}\right)+c\left(\sqrt{1-c^2}\right)=$

1) 2abc 2) abc 3) 1/2 abc 3) 1/3 abc

17. If x_1, x_2, x_3 are the roots of $x^3-6x^2+11x-6=0$ then $\cot^{-1}(x_1) + \cot^{-1}(x_2) + \cot^{-1}(x_3)=$

1) 0 2) $\pi/2$ 3) π 4) $3\pi/2$

18. If $\sin^{-1}\left(x-\dfrac{x^2}{2}+\dfrac{x^3}{4}.....\right)+\cos^{-1}\left(x^2-\dfrac{x^4}{2}+\dfrac{x^6}{4}.....\right)$ for $0<|x|<\sqrt{2}$ then x =

1) 1/2 2) 1 3) -1/2 4) -1

19. If $\sec^{-1}\dfrac{x}{a}-\sec^{-1}\dfrac{x}{b}=\sec^{-1}b-\sec^{-1}a$ then x =

1) a 2) b 3) ab 4) 1

20. If $u=\tan^{-1}\left(\dfrac{1}{\sqrt{\cos 2\theta}}\right)-\tan^{-1}\left(\sqrt{\cos 2\theta}\right)$ then sinu=

1) $\cot^2\theta$ 2) $\sin^2\theta$ 3) $\cos^2\theta$ 4) $\tan^2\theta$

21. If $3\sin^{-1}\left(\frac{2x}{1+x^2}\right)-4\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)+2\tan^{-1}\left(\frac{2x}{1-x^2}\right)=\frac{\pi}{3}$ then x =

1) $\frac{1}{\sqrt{3}}$ 2) $\frac{1}{\sqrt{2}}$ 3) $\frac{1}{3}$ 4) $\frac{1}{2}$

22. If $n\in N\sum_{k=1}^{n}\sin^{-1}(x_k)=\frac{n\pi}{2}$ then the value of $\sum_{k=1}^{n}x_k$ =

1) n 2) k 3) $\frac{k(k+1)}{2}$ 4) $\frac{n(n+1)}{2}$

23. If $\sin^{-1}x + \sin^{-1}y = \frac{2\pi}{3}$ & $\cos^{-1}x - \cos^{-1}y = \frac{\pi}{3}$ then the value of x & y respectively are

1) 1, 1/2 2) 1/2, 1 3) -1/2, 1 4) -1. 1/2

24. $\sin^{-1}(2x/1+x^2) + \cos^{-1}(1-x^2/1+x^2) = \pi/2$, x=_____

1) √2+1 2) √2-1 3) 1-√2 4) √2

25. The value of $\cos^{-1}\left\{\frac{1}{\sqrt{2}}\left(\cos\frac{9\pi}{10}-\sin\frac{9\pi}{10}\right)\right\}$ is

1) $\frac{3\pi}{20}$ 2) $\frac{7\pi}{10}$ 3) $\frac{7\pi}{20}$ 4) $\frac{17\pi}{20}$

26. $\tan^{-1}\left[\frac{\sqrt{1+\sin x}-\sqrt{1-\sin x}}{\sqrt{1+\sin x}+\sqrt{1-\sin x}}\right]=$

1) x 2) $\frac{x}{2}$ 3) $\frac{x^2}{2}$ 4) 2x

27. $\tan^{-1}5/6 + 1/2\tan^{-1}11/60$=

1) π 2) π/2 3) π/4 4) 3 π/4

28. If $x=\tan^{-1}(1) + \cos^{-1}(-1/2) + \sin^{-1}(-1/2)$ & $y=\cos[1/2\cos^{-1}(1/8)]$, then

1) x=2 π y 2) y=3 π x 3) x= π y 4) y= π x

KEY

1) **2**	2) **3**	3) **4**	4) **4**	5) **3**	6) **4**	7) **4**	8) **2**	9) **2**	10) **1**
11) **2**	12) **3**	13) **2**	14) **2**	15) **2**	16) **1**	17) **2**	18) **2**	19) **3**	20) **4**
21) **1**	22) **1**	23) **2**	24) **2**	25) **4**	26) **2**	27) **3**	28) **3**	29)	30)

AIEEE PROBLEMS

1. If $Sin^{-1}x + Sin^{-1}(x/5) + Cosec^{-1}(5/4) = \pi/2$ then a value of x is [2007]

1) 1 **2) 3** 3) 4 4) 5

(Key: 2)

13. HYPERBOLIC FUNCTIONS

1. $\text{Sin } hx = \frac{e^{x} - e^{-x}}{2}$

2. $\cosh x = \frac{e^{x} + e^{-x}}{2}$

3. $\tanh x = \frac{e^{x} - e^{-x}}{e^{x} + e^{-x}}$

4. $\coth x = \frac{e^{x} + e^{-x}}{e^{x} - e^{-x}}$

5. $\text{sech}x = \frac{2}{e^{x} + e^{-x}}$

6. $\text{Cosech}x = \frac{2}{e^{x} - e^{-x}}$

7. $\cosh^2 x - \sinh^2 x = 1$

8. $\text{sech}^2 x + \tanh^2 x = 1$

9. $\text{cot } h^2 x - \text{cosec } h^2 x = 1$

10. $\text{Sin } h2x = 2\sinh x \cosh x = \frac{2 \tanh x}{1 - \tanh^2 x}$

11. $\cosh 2x = \cosh^2 x + \sinh^2 x = 2 \cosh^2 x - 1 = \frac{1 + \tanh^2 x}{1 - \tanh^2 x} = 1 + 2\sinh^2 x$

12. $\tanh 2x = \frac{2\tanh x}{1 + \tanh^2 x}$

13. $(\cosh x + \sinh x)^n = \cosh nx + \sin hnx = e^{nx}$

14. $\text{Sin } h^{-1} x = \log (x + \sqrt{x^2 + 1})$

15. $\text{Cosh}^{-1} x = \log (x + \sqrt{x^2 - 1})$

16. $\text{Tan } h^{-1} x = 1/2 \log (1+x) / (1-x)$

17. $\cot h^{-1} x = 1/2 \log (x+1)/(x-1)$

18. $\sin h\, 3x = 3 \sin hx + 4 \sin h^3 x$

19. $\cosh 3x = 4 \cosh^3 x - 3 \cosh x$

20. $\tanh 3x = \dfrac{3 \tanh x + \tanh^3 x}{1 + 3 \tanh^2 x}$

21. $\cosh (\log x) = 1/2 (x + 1/x)$

22. $\sin h (\log x) = 1/2 (x - 1/x)$

23. $\tanh^2 (x/2) = \dfrac{\cosh x - 1}{\cosh x + 1}$

24. $\sin h(-x) = - \sinh x$

25. $\cosh(-x) = \cosh x$

26. $\sin h (ix) = i \sin x$

27. $\cosh (ix) = \cos x$

28. $\sin h^{-1} x = \cos h^{-1} \sqrt{1+x^2}$

29. $\cosh^{-1} x = \sin h^{-1} \sqrt{x^2-1}$

30. $\sin h (\sin h^{-1} x) = x$

    $\sin h^{-1}(\sinh x) = x$

31. $\cos x = \dfrac{e^{ix} + e^{-ix}}{2}$

32. $\sin x = \dfrac{e^{ix} - e^{-ix}}{2i}$

33. $e^{ix} = \cos x + i \sin x$ (Euler's formula)

34. If $u = \log \tan(\pi/4 + \theta/2)$ then
    1) $\tanh u/2 = \tan\theta/2$
    2) $\tanh u = \sin\theta$
    3) $\cosh u = \sec\theta$
    4) $\sinh u = \tan\theta$

35. $\tanh(\alpha-\beta) = \dfrac{\tanh\alpha - \tanh\beta}{1-\tanh\alpha.\tanh\beta}$

36. $\tanh(\alpha+\beta) = \dfrac{\tanh\alpha + \tanh\beta}{1+\tanh\alpha.\tanh\beta}$

Exercise-A

1. cosh2+sinh2=
   1) e 2) e^2 3)1/e 4) $1/e^2$

2. $e^{i\theta} + e^{-i\theta}$ =_____
   1)sin θ 2) 2 sin θ 3) cosθ 4) 2 cos θ

3. If cosh(-x) = k coshx then k=_____
   1)1 2) 2 3)3 4)-1

4. If tanh (-x) = k tanhx then k=_____
   1)1 2) 2 3)-2 4)-1

5. sinh(0) =
   1)1 2) 1/2 3) 0 4) -1

6. cosh(0) =
   1) 1 2) 1/2 3) 2 4) 1/4

7. If $\dfrac{\text{cothx+1}}{\text{cothx-1}} = e^{kx}$ then k=_____
   1) 2 2)1 3)3 4)-1

8. $\dfrac{1+\tanh x}{1-\tanh x}$ =_____
   1) cosh2x+sinh2x 2) coshx+sinhx 3) coshx-sinhx 4) cosh2x-sinh2x

9. $\dfrac{1+\tanh\alpha\,\tanh\beta}{\tanh\alpha+\tanh\beta}$ =_____
   1) coth(α-β) 2) coth(α+β) 3) tanh(α+ β) 4) tanh(α-β)

10. cosh (1) + sinh(-1)=_____
    1) e 2) e^2 3) 1/e 4) $1/e^2$

11. $\left(\dfrac{1+\tanh x}{1-\tanh x}\right)^{10}$ = coshnx + sinhnx then n=_____
    1)20 2)5 3)10 4) 4

12. $\sin h^{-1} 4$=_____
1) $\log (1+\sqrt{2})$ 2) $\log (\sqrt{2}+5)$ 3) $\log (4+\sqrt{17})$ 4) $\log (2-\sqrt{5})$

13. $\cos h^{-1} 2$=_____
1)$\log (\sqrt{2}+1)$ 2) $\log (2+\sqrt{3})$ 3) $\log (2-\sqrt{3})$ 4) $\log (\sqrt{2}-1)$

14. $\tanh^{-1} 2$=_____
1) log2 2) log3 3) ½log3 4) 2 log3

15. If $x = \log \tan_e (\pi/4 + \theta/2)$ then coshx =_____
1) $\sec\theta$ 2) $\tan\theta$ 3) $\operatorname{cosec} \theta$ 4) $\cot \theta$

16. $\log_e \cot (\pi/4 + \theta) = x$ sinhx=_____
1) $\tan\theta$ 2) $-\tan\theta$ 3) $-\tan 2\theta$ 4) $\tan 2 \theta$

17. $\log_e \tan (\pi/4 + \theta) = x$, sinhx =_____
1) $\tan\theta$ 2) $\tan 2\theta$ 3) $-\tan\theta$ 4) $\tan 2 \theta$

18. sinhx = 15/7, coshx=_____
1) 7/17 2) 17/7 3) -7/17 4) 274/49

19. $e^{\sinh^{-1}(\tan\theta)}$=_____
1) $\sec \theta$ 2) $\sec\theta \tan\theta$ 3) $\sec \theta + \tan\theta$ 4) $\tan \theta$

20. $e^{\cosh^{-1}(\operatorname{cosec} \theta)}$=_____
1) $\operatorname{cosec} \theta$ 2) $\operatorname{cosec} \theta - \cot \theta$ 3) $\operatorname{cosec} \theta \cot \theta$ 4) $\operatorname{cosec} \theta + \cot\theta$

21. $\cosh^{-1} (1)$ =_____
1) $\log (\sqrt{2}+1)$ 2) $\log (\sqrt{2}-1)$ 3)1 4) 0

22. $\log (2+\sqrt{5})$ =_____
1)$\sinh^{-1}1$ 2)$\cosh^{-1}1$ 3)$\sinh^{-1}2$ 4)$\cosh^{-1}2$

23. $\cosh 3^0 + \sinh 3^0$
1)e^2 2)$e^3/2$ 3)e^3 4)$e^2/2$

24. $\cot h(-x) = k \coth x$ then θ=_____
1)1 2)2 3)-2 4)-1

25. $e^{i\theta} - e^{-i\theta}$ =_____
1)$2\sin\theta$ 2)$2\cos\theta$ 3)$2i\sin\theta$ 4)$2i\cos\theta$

26. If sinhx=3 then x=_____

1)$\log(3+\sqrt{10})$ 2)$\log 3$ 3)$\log(3-\sqrt{10})$ 4)$\log 10$

27. $\cosh 2x+\sinh 2x=$_____
1)$2e^{2x}$ 2)$3e^{2x}$ 3)e^{2x} 4)$(1+\tanh x)/(1-\tanh x)$

28. $\cosh(x+y)\cosh(x-y)=$_____
1)$\cosh^2 x+\sinh^2 y$ 2)$\cosh^2 y+\sinh^2 x$ 3)$\sin^2 y$ 4)$\cosh x+\sinh x$

29. If $f(x) = \cosh x + \sinh x$ then $f(x_1+x_2+\ldots+x_n) =$____
1)0 2)$f(x_1)+f(x_2)+f(x_3)+\ldots$ 3)$f(x_1).f(x_2).f(x_3)\ldots f(x_n)$ 4)1

30. $(\cosh x-\sinh x)^n =$_____
1)e^{nx} 2)e^{-nx} 3)e^{x} 4)e^{-x}

31. $\frac{\tanh x}{\operatorname{sech} x-1} + \frac{\tanh x}{\operatorname{sech} x+1} =$_____
1)$2\operatorname{cosech} x$ 2)$-2\operatorname{cosech} x$ 3)$\operatorname{cosech} x$ 4)$-\operatorname{sech} x$

32. $(\sinh 2x)/(1+\cosh 2x)=$_____
1)$\tanh x$ 2)$-\tanh x$ 3)$\coth x$ 4)$-\coth x$

33. $(\cosh 2x-1)/(\sinh 2x) =$_____
1)$\tanh x$ 2)$\tanh 2x$ 3)$\coth x$ 4)$-\tanh x$

34. $\cosh^4 x-\sinh^4 x=$_____
1)$\cosh x$ 2)$\cosh 2x$ 3)$\sinh 2x$ 4)$\coth 2x$

35. $(\cosh\theta_1 +\sinh\theta_1)(\cosh\theta_2 +\sinh\theta_2)\ldots(\cosh\theta_n +\sinh\theta_n)=$_____
1)$\cosh(\theta_1+\theta_2+\theta_3+\ldots\theta_n)$ 2)$\sinh(\theta_1+\theta_2+\theta_3+\ldots\theta_n)$
3) $\cosh(\theta_1+\theta_2+\theta_3+\ldots\theta_n)+\sinh(\theta_1+\theta_2+\theta_3+\ldots\theta_n)$
4) $\cosh(\theta_1+\theta_2+\theta_3+\ldots\theta_n)-\sinh(\theta_1+\theta_2+\theta_3+\ldots\theta_n)$

36. Match the following

I.	$\sin 420^0\cos 390^0+\cos(-660^0)\sin(-330^0)$	a)2
II.	$\sin 600^0\tan(-690^0)+\sec 840^0\cot(-945^0)$	b)2
III.	$\tan 315^0\cot(-405^0)+\cot 495^0\tan(-585^0)$	c)0
IV.	$\cos 70^0\sin 510^0+\sin(-330^0)\cos(-390^0)$	d)3/2

1)a,b,c,d 2)b,d,a,c 3)c,a,d,b 4)d,c,b,a

37. A:If $-\pi/2<\theta<\pi/2$ and $x=\log_e[(1+\sin\theta)/\cos\theta]$ then $\sinh x=\tan\theta$
R: For $-\pi/2<\theta<\pi/2$, the value of $\sec\theta$ is positive.
1)A is false,R is false 2)A is false, R is true
3)A is true, R is false, 4)A is true, R is false, R $\Rightarrow$A

38. $x = \log_e (y + (\sqrt{y^2-1})$ then y= _____ (1994)
1) tanhx 2) cothx 3) sinhx 4) coshx

39. $\sinh^{-1} x = \log (5+\sqrt{26})$ then x=_____ (1996)
1) 5 2) sinhx 3) 25 4)1

40. $\sinh^{-1} x$ is an odd function /even function (1997)
1)odd 2)even 3)both 4)neither odd nor even

41. If $x = \tanh^{-1} y$, then $\log_e [(1+y)/(1-y)]$ =_____ (1998)
1)x 2)4x 3)2x 4)3x

42. $\cosh^{-1}x = \log_e(2+\sqrt{3})$, then x= [2000]
1)2 2)1 3)3 4)5

43. $\sinh^{-1}\left[\frac{x}{\sqrt{1-x^2}}\right] =$ [2001]
1)$\coth^{-1}x$ 2)$-\coth^{-1}x$ 3)$-\tanh^{-1}x$ 4)$\tanh^{-1}x$

44. sinh(ix)= [2002]
1)i sinx 2)sin(ix) 3)-i sinx 4)i sin (ix)

45. $\sinh^{-1}(2^{3/2})$= (2003)
1)$\log(2+\sqrt{18})$ 2)$\log(3+\sqrt{8})$ 3)$\log(3-\sqrt{8})$ 4)$\log(\sqrt{8}+\sqrt{27})$

46. If $x=\log_e[\cot(\pi/4+\theta)] \Rightarrow \sinh x =$ (2004)
1)$\tan 2\theta$ 2)$-\tan 2\theta$ 3)$\cot 2\theta$ 4)$-\cot 2\theta$

47. $2\tanh^{-1}(1/2) =$ (2005)
1)0 2)log 2 3)log 3 4) log4

48. $e^{\log(\cosh^{-1} 2)}$ (2006)
1)$\log(2-\sqrt{3})$ 2)$\log(\sqrt{3}-2)$ 3)$\log(2+\sqrt{3})$ 4)$\log(2+\sqrt{5})$

49. $\text{Sech}^{-1}(\sin\theta) =$ (2007)
1) $\log \tan\frac{\theta}{2}$ 2)$\log \sin\frac{\theta}{2}$ 3) $\log \cos\frac{\theta}{2}$ 4)$\log \cot\frac{\theta}{2}$

50. $\frac{1+\tanh x/2}{1-\tanh x/2} =$ (2008)
1)e^{-x} 2)e^{x} 3)$2e^{x/2}$ 4)$2e^{-x/2}$

51. $\sinh^{-1}2 + \sinh^{-1}3 = x \Rightarrow \cosh x =$ (2009)

1) $\frac{1}{2}\left(3\sqrt{5}+2\sqrt{10}\right)$ 2) $\frac{1}{2}\left(3\sqrt{5}-2\sqrt{10}\right)$

3) $\frac{1}{2}\left(12+2\sqrt{50}\right)$ 4) $\frac{1}{2}\left(12-2\sqrt{50}\right)$

52. $\tanh^{-1}x = a\log\left(\frac{1+x}{1-x}\right), |x|<1 \Rightarrow a =$ (2010)

1) 1 2) 2 3) $\frac{1}{2}$ 4) $\frac{1}{4}$

53. For $0 < x \le \pi, \sinh^{-1}(\cot x) =$ (2011)

1) $\log\left(\cot\frac{x}{2}\right)$ 2) $\log\left(\tan\frac{x}{2}\right)$

3) $\log(1+\cot x)$ 4) $\log(1+\tan x)$

54. $x = \log\left(\frac{1}{y}\sqrt{1+\frac{1}{y^2}}\right) \Rightarrow y =$ (2012)

1) tanhx 2) cothx 3) sechx 4) cosechx

55. $\tanh^{-1}\left(\frac{1}{2}\right) + \coth^{-1}(2) =$ (2013)

1) $\frac{1}{2}\log 3$ 2) $\frac{1}{2}\log 6$ 3) $\frac{1}{2}\log 12$ 4) log3

56. $sech^{-1}\left(\frac{1}{2}\right) - cos\,ech^{-1}\left(\frac{3}{4}\right) =$ (2014)

1) $log_e\left(\frac{1+\sqrt{3}}{3}\right)$ 2) $log_e\left(\frac{2+\sqrt{3}}{3}\right)$

3) $log_e\left(\frac{2-\sqrt{3}}{3}\right)$ 4) $log_e\left(3\left(2+\sqrt{3}\right)\right)$

57. If cosh2x = 199, then cothx = (2015)

1) $\frac{5}{3\sqrt{11}}$ 2) $\frac{5}{6\sqrt{11}}$ 3) $\frac{7}{3\sqrt{11}}$ 4) $\frac{10}{3\sqrt{11}}$

58. If $2\,sinh^{-1}\left(\frac{a}{\sqrt{1-a^2}}\right) = log\left(\frac{1+x}{1-x}\right)$ then x = (2015 A.P.)

1) a 2) $\frac{1}{a}$ 3) $\sqrt{1-a^2}$ 4) $\frac{1}{\sqrt{1-a^2}}$

59. For $\theta \in \left(0, \frac{\pi}{2}\right), \sec h^{-1}(\cos\theta) =$ (2016)

1) $\log\left|\tan\left(\frac{\pi}{6}+\frac{\theta}{2}\right)\right|$ 2) $\log\left|\tan\left(\frac{\pi}{3}+\frac{\theta}{2}\right)\right|$

3) $\log\left|\tan\left(\frac{\pi}{4}+\frac{\theta}{2}\right)\right|$ 4) $\log\left|\tan\left(\frac{\pi}{4}-\frac{\theta}{2}\right)\right|$

60. If $\cosh(x)=\frac{5}{4}$, then $\cosh(3x)=$ (2016AP)

1) $\frac{61}{16}$ 2) $\frac{63}{16}$ 3) $\frac{65}{16}$ 4) $\frac{61}{63}$

61.If $\cosh^{-1}x = 2\log_e\left(\sqrt{2}+1\right)$, then x = (2017)

1) 1 2) 2 3) 4 4) 3

62.If $x=\log_e\left[\cot\left(\frac{\pi}{4}+\theta\right)\right]$ where $|\theta|>\frac{\pi}{4}$ sinhx = (2017AP)

1) $\sin 2\theta$ 2) $\cos 2\theta$ 3) $\tan 2\theta$ 4) $-\tan 2\theta$

KEY

1) **2**	2) **4**	3) **1**	4) **4**	5) **3**	6) **1**	7) **1**	8) **1**	9) **2**	10) **3**
11) **1**	12) **3**	13) **2**	14) **3**	15) **3**	16) **3**	17) **4**	18) **3**	19) **1**	20) **4**
21) **4**	22) **3**	23) **3**	24) **4**	25) **3**	26) **1**	27) **4**	28) **1**	29) **3**	30) **2**
31) **2**	32) **1**	33) **1**	34) **2**	35) **3**	36) **2**	37) **4**	38) **4**	39) **1**	40) **1**
41) **3**	42) **3**	43) **1**	44) **2**	45) **3**	46) **3**	47) **2**	48) **2**	49) **4**	50) **2**
51) **3**	52) **3**	53) **1**	54) **4**	55) **4**	56) **2**	57) **4**	58) **1**	59) **3**	60) **4**
61)	62) **4**	63)	64)	65)	66)	67)	68)	69)	70)

Exercise-B

1. A:If $-\pi/2<\theta<\pi/2$ and x=loge [(1+sinθ)/cosθ]then sinhx=tanθ
   R: For $-\pi/2<\theta<\pi/2$, the value of secθ is positive.
   1)A is false,R is false 2)A is false, R is true
   3)A is true, R is false, 4)A is true, R is false, R ⇒A
2. If cos α cosh β = 1, then β =
   1) log sec $\frac{\alpha}{2}$ 2) log tan $\frac{\alpha}{2}$ 3) log (sec α+tan α) 4) log (sec α tan α)
3. $\sinh^{-1}\left[\frac{x}{\sqrt{1-x^2}}\right]=$ (2001)
   1)$\coth^{-1}x$ 2)-$\coth^{-1}x$ 3)-$\tanh^{-1}x$ 4)$\tanh^{-1}x$
4. Match the following

Function	Domain
I. sechx	a)R-[-1,-]

II. $\text{Coth}^{-1}x$ b)R-{0}
III.$\text{Cosh}^{-1}x$ c)R
IV.cothx d)$\{1,\alpha)$
1)c,a,b,d 2)a,c,b,d 3)a,c,d,b 4)c,a,d,b

5. Match the following

Function	Range
I. coshx	a)$[0,\alpha)$
II. tanhx	b)(-1,1)
III. $\text{Sech}^{-1}x$	c)$[1, \alpha)$
IV. $\text{Coth}^{-1}x$	d)R-{0}

1)c.a,b,d 2)a,c,b,d 3)a,c,d,b 4)c,b,a,d

6 Sin[log(2+ $\sqrt{5}$)]=
1) 2 2) 3 3) 2- $\sqrt{5}$ 4) 2+ $\sqrt{5}$

7. If f(x)=coshx+sinhx & f(x)f(y)=f(k) then k =
1) xy 2) $\frac{x}{y}$ 3) x-y 4) x+y

8. If cosh(x)=sec α then cosech(x)=
1) sin α 2) cos α 3) tan α 4) cot α

11. If α is an acute angle & y=log[tan(π /4 + x/2)] then cosx.coshy=
1) 0 2) -1 3) 1 4) 2

9. $\text{sech}^{-1}(1/3)$ =
1) log(3+ $\sqrt{8}$) 2) log(3- $\sqrt{8}$) 3) log($\sqrt{3+\sqrt{8}}$) 4) log($\sqrt{3-\sqrt{8}}$)

10. If sinxcoshy = cos θ , cosxsinhy=sin θ then $\sinh^2 y$=
1) $\cosh^2 x$ 2) $\cos^2 x$ 3) $\cosh^3 x$ 4) $\sinh^3 x$

11. If $\tanh^2 x = \tan^2 \theta$ then cosh(2x)=
1) cos2 θ 2) sec2 θ 3) sin2 θ 4) cos θ

12. If cosh(x)=sec θ then $\tanh^2(x/2)$=
1) $\tan^2 \theta/2$ 2) $\cot^2 \theta/2$ 3) $-\tan^2 \theta/2$ 4) $-\cot^2(\theta/2)$

13. If cosh2x=99, then tanhx=
1) $\frac{5}{7\sqrt{2}}$ 2) $\frac{7}{5\sqrt{2}}$ 3) $\frac{5\sqrt{7}}{2}$ 4) $\frac{7\sqrt{5}}{2}$

14. sinh3-cosh3=
1) e^{-3} 2) $-e^{-3}$ 3) e^3 4) $-e^3$

15. If x>0 then $\tanh^{-1}\left(\frac{x^2-1}{x^2+1}\right)$=
1) $\log_e(2x)$ 2) $\log_e(x)$ 3) $\log_e(3x)$ 4) $\log_e(5x)$

KEY

1) 4	2) 3	3) 3	4) 4	5) 4	6) 1	7) 4	8) 4	9) 1	10) 2
11) 2	12) 1	13) 2	14) 2	15) 2	16)	17)	18)	19)	20)

14. PROPERTIES OF TRIANGLE

1. Sine rule :

$$\frac{a}{SinA} = \frac{b}{SinB} = \frac{c}{SinC} = 2R$$

a= 2R sinA , b= 2R sinB, c= 2R sinC

2. Cosine Rule :

$a^2 = b^2+c^2-2bc \cos A$

$b^2=c^2+a^2-2ca \cos B$

$c^2=a^2+b^2-2ab \cos C$

$\text{Cos } A = \frac{b^2+c^2-a^2}{2bc}$, $\cos B = \frac{c^2+a^2-b^2}{2ca}$, $\cos C = \frac{a^2+b^2-c^2}{2ab}$

3. Projection formula:

a=b cos C + c Cos B

b=c cos A + a cos C

c= a cos B + b cos A

4. $\Delta = 1/2\ bc \sin A = 1/2\ ca \sin B = 1/2\ ab \sin C$

$\Delta = \sqrt{s(s-a)(s-b)(s-c)}$

$\Delta = 2R^2 \sin A \sin B \sin C = abc/4R$

5. $\text{Sin}A = \frac{2\Delta}{bc} = \frac{2}{bc}\sqrt{s(s-a)(s-b)(s-c)}$

$\text{Sin}B = \frac{2\Delta}{ca} = \frac{2}{ca}\sqrt{s(s-a)(s-b)(s-c)}$

$\text{Sin } C = \frac{2\Delta}{ab} = \frac{2}{ab}\sqrt{s(s-a)(s-b)(s-c)}$

6. $\text{Sin } A/2 = \sqrt{(s-b)(s-c)/bc}$, $\sin B/2\ \sqrt{(s-c)(s-a)/ca}$, $\sin C/2 = \sqrt{(s-a)(s-b)/ab}$

7. $\text{Cos } A/2 = \sqrt{s(s-a)/bc}$, $\cos B/2\ \sqrt{s(s-b)/ca}$, $\cos C/2 = \sqrt{s(s-c)/ab}$

8. $\tan A/2 = \sqrt{(s-b)(s-c)/s(s-a)} = \frac{(s-b)(s-c)}{\Delta} = \Delta / s(s-a) = \sqrt{rr_1 / r_2r_3} = \sqrt{(r_1-r)/(r_2+r_3)}$

$$\tan B/2 = \sqrt{(s-c)(s-a)/s(s-b)} = \frac{(s-c)(s-a)}{\Delta} = \Delta/s(s-b) = \sqrt{r\, r_2/r_1 r_3} = \sqrt{(r_2 - r)/(r_1 + r_3)}$$

$$\tan C/2 = \sqrt{(s-a)(s-b)/s(s-c)} = \frac{(s-a)(s-b)}{\Delta} = \Delta/s(s-c) = \sqrt{r r_3/r_1 r_2} = \sqrt{(r_3 - r)/(r_1 + r_2)}$$

9. $\text{Cot } A/2 = \sqrt{s(s-a)/(s-b)(s-c)} = s(s-a)/\Delta$

   $\text{Cot } B/2 = \sqrt{s(s-b)/(s-c)(s-a)} = s(s-b)/\Delta$

   $\text{Cot } C/2 = \sqrt{s(s-c)/(s-a)(s-b)} = s(s-c)/\Delta$

10. Napier's Analogy:

    $\tan((B-C)/2) = (b-c)/(b+c)\ \text{Cot } A/2 = (b-c)/(b+c) \tan\left(\frac{B+C}{2}\right)$

    $\tan((C-A)/2) = (c-a)/(c+a)\ \text{Cot } B/2 = (c-a)/(c+a) \tan\left(\frac{C+A}{2}\right)$

    $\tan((A-B)/2) = (a-b)/(a+b)\ \text{Cot } C/2 = (a-b)/(a+b) \tan\left(\frac{A+B}{2}\right)$

11. Mollweide formulae :

    $\frac{a-b}{c} = \sin\left(\frac{A-B}{2}\right) / \cos C/2$ $\qquad$ $\frac{a+b}{c} = \cos\left(\frac{A-B}{2}\right) \sin C/2$

    $\frac{b-c}{a} = \frac{\sin \frac{B-C}{2}}{\text{Cos } A/2}$ $\qquad$ $\frac{b+c}{a} = \frac{\cos \frac{B-C}{2}}{\text{Sin } A/2}$

    $\frac{c-a}{b} = \frac{\sin \frac{C-A}{2}}{\text{Cos } B/2}$ $\qquad$ $\frac{c+a}{b} = \frac{\text{Cos } \frac{C-A}{2}}{\sin B/2}$

12. $\text{Cot } A = \frac{b^2+c^2-a^2}{4\Delta}$, $\text{Cot } B = \frac{c^2+a^2-b^2}{4\Delta}$, $\cot C = \frac{a^2+b^2-c^2}{4\Delta}$

13. $\text{Cot } A + \cot B + \cot C = \frac{a^2+b^2+c^2}{4\Delta}$

14. $\text{Cot}A/2 + \cot B/2 + \cot C/2 = \frac{(a+b+c)^2}{4\Delta}$

15. If Cot A/2 cot B/2, cot C/2 are in A.P. then a,b,c are also in A.P.

16. If cot A, cot B, cot C are in A.P. then a,b,c are also in A.P.

17. If $\sin^2 A/2$, $\sin^2 B/2$, $\sin^2 C/2$ are in H.P. then a,b,c are also in H.P.

18. $r = \Delta/s$

$= (s-a)\tan A/2 = (s-b)\, B/2 = (s-c)\tan C/2$

$= \dfrac{a}{\text{Cot } B/2 + \cot C/2} = \dfrac{b}{\text{Cot } C/2 + \text{Cot } A/2} = \dfrac{c}{\text{Cot } A/2 + \cot B/2}$

$= 4R \sin A/2 \quad \sin B/2 \quad \sin C/2$

19. $r_1 = \dfrac{\Delta}{s-a} = s \tan A/2 = (s-b)\text{ Cot } C/2 = (s-c)\cot B/2$

$= \dfrac{a}{\tan B/2 + \tan C/2} = 4R \sin A/2 \cos B/2 \cos C/2$

20. $r_2 = \dfrac{\Delta}{s-b} = s \tan B/2 = (s-c)\cot A/2 = (s-a)\cot C/2$

$= \dfrac{b}{\tan C/2 + \tan A/2} = 4R \cos A/2 \sin B/2 \text{ Cos } C/2$

21. $r_3 = \dfrac{\Delta}{s-c} = s \tan C/2 = (s-a)\cot B/2 = (s-b)\cot A/2$

$= \dfrac{c}{\tan A/2 + \tan B/2} = 4R \cos A/2 \cos B/2 \sin C/2$

22. $1/r_1 + 1/r_2 + 1/r_3 = 1/r$

23. $rr_1r_2r_3 = \Delta^2$

24. $r_1r_2 + r_2r_3 + r_3r_1 = s^2$

25. $r(r_1+r_2+r_3) = ab + bc + ca - s^2$

26. $r_1 - r = 4R \sin^2 A/2$, $r_2 + r_3 = 4R \cos^2 A/2$

$r_2 - r = 4R \sin^2 B/2$, $r_1 + r_3 = 4R \cos^2 B/2$

$r_3 - r = 4R \sin^2 C/2$, $r_1 + r_2 = 4R \cos^2 C/2$

27. $r - r_1 + r_2 + r_3 = 4R \cos A$

$r + r_1 - r_2 + r_3 = 4R \cos B$

$r + r_1 + r_2 - r_3 = 4R \cos C$

$r_1 + r_2 + r_3 - r = 4R$

28. If P_1, P_2,P_3 are the lengths of the altitudes in a triangle form A,B,C respectively, then

i) $1/P_1 + 1/P_2 + 1/p_3 = 1/r$

ii) $1/P_2 + 1/P_3 - 1P_1 = 1/r_1$

iii) $1/P_1 + 1/P_3 - 1/P_2 = 1/r_2$

iv) $1/P_1 + 1/p_2 - 1/p_3 = 1/r_3$

29. $r_1(r_2+r_3) = as$

$r_2(r_3+r_1) = bs$

$r_3(r_1+r_2) = cs$

Exercise-A

1. c (a cos B – b cosA)

1) a^2+b^2 2) a^2-b^2 3) b^2-a^2 4) b^2a^2

2. In an equilateral triangle Σ tan A=_____

1)√3 2) 2√3 3) 1/√3 4) 3 √ 3

3. In an equilateral Σ $\cos^2$ A=_____

1)1/4 2) 2/3 3) 3/4 4) 4/3

4. In an equilateral Σ $\sin^2$ A=_____

1)9/4 2) 4/9 3) 1/4 4) 1/9

5. In an equilateral triangle Σ cos A=_____

1)1/2 2) ¼ 3) 3/2 4) √3/2

6. [(b-c)/a] sin [(B+C)/2] =_____

1) sin[(B-C)/2] 2) sin[(B+C)]/2 3)(B+C) /2 4) sin(B+C)

7. (b+c) sinA/2 =_____

1)cos(B-C/2) 2) a cos [(B-C)/2] 3) cos ((B+C)/2) 4) a cos ((B+C)/2)

8. [(b+c)/a] sin A/2=_____

1)cos ((B+C)/2) 2) cos [(B-C)/2] 3) (b+c)cos((B-C)/2) 4) (b+c) cos ((B+C)/2)

9. b $\cos^2$ C/2 + c $\cos^2$ B/2=_____

1)s 2) s^2 3) 2s 4) $2s^2$

10. $(a-b)^2$ $\cos^2$ C/2 +$(a+b)^2$ $\sin^2$ C/2=_____

1)c 2)c^2 3) c^3 4) $2c^2$

11. a(cos C- cos B) =_____

1) (b-c) 2) (b-c) $\cos^2$ A/2 3) 2(b-c) $\cos^2$ A/2 4) 2(b+c) $\cos^2$A/2

12. [(a+b)/(a-b)] tanC/2=_____
1) Cot A/2 2) cot ((B-A)/2) 3) cot B/2 4) cot ((A-B)/2)

13. $\frac{\tan A/2-\tan B/2}{\tan A/2+\tan B/2}$ =_____
1)(a-b)/c 2) 2(a-b)/c 3) (a-b)/2c 4) 2(a+b)/c

14. a $\sin^2$ C/2 + c $\sin^2$ A/2=_____
1) S 2) (S-a) 3) (S-b) 4) (S-c)

15. $\frac{\sin (A-B)}{\sin(A+B)}$ = _____
1) a^2-b^2 2) $((a^2-b^2)/c^2)$ 3) a^2+b^2 4) $(a^2+b^2)/c^2$

16. $\frac{a-b \cos C}{c- b \cos A}$ =_____
1)c 2) –c 3) –c/a 4) c/a

17. (a+b+c) (tanA/2 + tan B/2) =
1) 2acot (A/2) 2) 2bcot (B/2) 3) 2cotC/2 4) 2c cot C/2

18. $\frac{a^2+b^2-c^2}{a^2-b^2+c^2}$ =_____
1)tanA/tanB 2) tanB/tanC 3) tanC/tanB 4) tanB/tanA

19. Σ sin (B-C) /bc =_____
1)1 2) 2 3)3 4) 0

20. $\Sigma \frac{b^2 - c^2}{a} \cos A$ =_____
1)0 2)2 3)1 4)-1

21. $\frac{a- b+c}{b+c-a}$ = _____
1)tan B/2 2) tan C/2 3) tan (A/2) / tan (B/2) 4) tan (B/2) / tan (A/2)

22. Σ a cos A=_____
1)4Rcos A cos B cosC 2) 4 R sin A sin B sinC
3) 2R sin A sin BsinC 4) 2RcosAcosB cosC

23. r_1 -r =_____, r_2 –r =_____, r_3 –r=_____
1)4 R $\sin^2$A/2 2) 4R$\sin^2$B/2 3) 4R $\sin^2$C/2

4) 4 R $\sin^2 A/2$ & $4R\sin^2 B/2$ & 4R $\sin^2 C/2$

24. r_1+r_2 =_____

1) $4R\cos^2 C/2$ 2) $4R\cos^2 B/2$ 3) $4R\cos^2 Ac/2$ 4) 4R

25. r_2+r_3 =_____

1) $4R\cos^2 A/2$ 2) $4R\cos^2 B/2$ 3) $4R\cos^2 C/2$ 4) 4R

26. r_1+r_3 =_____

1) $4R\cos^2 B/2$ 2) $4R\cos^2 A/2$ 3) $4R\cos^2 C/2$ 4) 4R

27. In a ΔABC $r_1 = r_2 + r_3 + r$ then the triangle is _____

1) right angled 2) isosceles 3) scalene 4) equilateral

28. In a ΔABC if $r\, r_1 = r_2\, r_3$ then triangle is_____

1)right angled 2) isosceles 3) scalene 4) equilateral

29. In a ΔABC if $r : r_1 = r_2 : r_3$ then

1)A=90 2)B=90 3)C=90 4) C=45

30. In a Δ ABC if $2R+r=r_1$ then triangle is _____

1)right angled isosceles 2) right angled 3) isosceles 4) equilateral

31. In a Δ ABC if a/cosA =b/cosB =c/cosC then triangle is _____

1)right angled 2) scalene 3) equilateral 4) isosceles

32. In a Δ ABC if a/cosB =b/cosA then triangle is _____

1)right angled isosceles 2) right angled 3) isosceles 4) scalene

33. If a:b:c =7:8:9 then cosA:cosB:cosC =_____

1)7:8:9 2) 14:16:18 3) 14: 11: 6 4) 14: 8:6

34. In a Δ ABC if b+c : c+a : a+b =11:12:13 then cosA:cosB:cosC =_____

1)7:19:25 2) 7:12:13 3) 12:13:7 4) 19: 25:7

35. If sides are 13, 14, 15 find s, Δ, r, R, r_1,r_2,r_3.

1) 21 ,84,4,65/8, 21/2,12,14 2)21,42,68,32,33,43,12
3)3,21,84,56,22,44 4)NONE

36. If r_1=8 ,r_2=12,r_3=24 find r,s,R,a,b,c and Δ.

1) 4,24,10,12,16,20,96 2)4,12,24,16,34,89,55
3)4,12,10,12,89,45,34 4)1,2,4,56,,36,48,12

37. If $\sin^2 A/2, \sin^2 B/2, \sin^2 C/2$ are in H.P then a,b,c are in_____
1)H.P 2) A.P. 3) G.P. 4) A.G.P

38. If tanA, tanB, tanC are in H.P then a^2, b^2, c^2 are in _____
1)H.P. 2) G.P. 3) A.P. 4) A.G.P.

39. If $a^4 + b^4 + c^4 = 2c^2 (a^2+b^2)$ then C=_____
1)30^0 2) 45^0 3) 60^0 4) 75^0

40. If $a^4+b^4+c^4+ a^2b^2 = 2c^2 (a^2+b^2)$ then C=_____
1)30^0 2) 60^0 3) 45^0 4) 90^0

41. If tanA/2=5/2,tanB/2=20/37 then tanC/2=_____
1)2/5 2) 3/5 3) 4/5 4) 5/4

42. If (a+b+c)(b+c-a)=3bc then A=_____
1)45^0 2) 60^0 3) 80^0 4) 90^0

43. If sides are in A.P then tanA/2.tanC/2=_____
1)1 2) 1/2 3) 1/3 4) ¼

44. If r_1, r_2, r_3 are in H.P then a,b,c are in _____
1)A.P 2)G.P. 3)H.P. 4) A.G.P.

45. Σ a $\cos^2$ A/2=_____
1) S+ ΔR 2) S+Δ/R 3) S-ΔR 4) S-Δ/R

46. Σ cot A=_____
1)$(a^2+b^2+c^2)/4\Delta$ 2) $(a^2+b^2+c^2)/2\Delta$ 3) $4\Delta / (a^2+b^2+C^2)$ 4) $2\Delta/ (a^2+b^2+c^2)$

47. Σ cot A/2=_____
1) S^2/Δ 2) S/Δ 3) Δ/S 4) Δ ./S^2

48. $\dfrac{\cot A + \cot B + \cot C}{\cot A/2 + \text{coat } B/2 + \cot C/2}$ = _____
1)$a+b^2+c^2$ 2) $(a^2+b^2+c^2) / 4s^2$ 3) $1/ (a^2+b^2+c^2)$ 4) $4s^2 /(a^2+b^2+c^2)$

49. If p_1, p_2, p_3 are the altitudes of a triangle then $1/p_1+1/p_2+1/p_3$=_____
1)r_1 2) $1/r_1$ 3) $2/r_1$ 4) 1/r

50. $1/p_1+1/p_2-1/p_3$=_____
1) $1/r_3$ 2) r_3 3) $2r_3$ 4)$-r_3$

51. $1/p_1-1/p_2+1/p_3$=_____
1)r_2 2) $1/r_2$ 3) $1/r_3$ 4) r_3

52. $p_1p_2p_3$=_____
1) Δ^2/r 2) $2\Delta^2/R$ 3) $2\Delta^2/r$ 4) Δ^2/R

53. $\cos A/p_1+\cos B/p_2+\cos C/p_3$=_____[$\Delta=2R^2\sin A\sin B\sin C$, $\sum\sin 2A=4\sin A\sin B\sin C$]
1)R 2) 1/R 3) 1/r 4)r

54. $\Sigma\cos A$=_____
1)1+r/R 2) 1-r/R 3) r/R 4) R/r

55. $a\cot A+b\cot B+c\cot C$=_____
1)R+r 2) 2R+2r 3) 2R-r 4) R-2r

56. In a ΔABC $\cos^2 A/2+\cos^2 B/2+\cos^2 C/2$ =_____
1) 2+r/2R 2) 2-r/2R 3) r/2R 4) R/2r

57. $\Sigma\frac{\cos^2 A/2}{a}$=_____
1)s/abc 2) s^2/abc 3) s^3/abc 4)s^4/abc

58. In a ΔABC, $2\cos A/a+\cos B/b+2\cos C/c=a/bc+b/ca$ then A =
1)90^0 2) 45^0 3) 150^0 4) 60^0

59. Match the following

I. If a=5,A=30^0 then	a)A=120^0
II. If a=8,b=15,c=17 then	b)r=R
III. If b=c=r then	c)R=17/2
IV.In an equilateral triangle	d)R=5
	e)r=R/2

1)e,b,d,c 2)b,a,c,d 3)a,d,b,a 4)d,c,a,e

60. A : There is no triangle ABC for A=$\tan^{-1}2$,B=$\tan^{-1}3$.
R : If x>0,y>0 and xy>1 then $\tan^{-1}x+\tan^{-1}y=\pi+\tan^{-1}[(x+y)/1-xy]$
1)A is true, R is true and R is correct explanation of A
2)A is true, R is true and R is not correct explanation of A
3)A is true, R is false 4) A is false, R is true

PREVIOUS EAMCET PAPERS PROBLEMS

61. In ΔABC, a cos A= b cos B. then the Δ is _____ [1985]
1)right angled or isosceles 2) right angled but not isosceles
3) only isosceles 4)scalene

62. The smallest angle of the triangle whose sides are $6+\sqrt{12}$, $\sqrt{48}$, $\sqrt{24}$ is ___ [1985]
1)$\pi/3$ 2) $\pi/6$ 3) $\pi/4$ 4) $\pi/2$

63. a=2 , b=3 , c=4 CosA=_____ [1985]
1)8/7 2) 9/7 3) 6/7 4) 7/8

64. If $c^2=a^2+b^2$, 2s=a+b+c then 4s (s-a) (s-b) (s-c) =_____ [1986]
1)S^4 2) b^2c^2 3)c^2a^2 4) a^2b^2

65. In an equilateral triangle r: R: r_1 =_____ [1986]
1) 3:2:1 2) 3:1:2 3) 1:2:3 4) 2:3:1

66. If x^2+x+1 , 2x+1 , x^2-1 are the sides of a Δ then its largest angle is _ [1987]
1)120^0 2) 135^0 3) 115^0 4) 150^0

67. The diameter of the circumcircle of a triangle whose sides are 61, 60, 11 is __ [1988]
1) 61 2) 61/2 3) 60 4) 30

68. $a^3\cos(B-C)+b^3\cos(C-A)+c^3\cos(A-B)$=_____ [1989]
1)3abc 2) 3(a+b+c) 3) abc(a+b+c) 4) 0

69. In a triangle ABC, a=13, b=14, c=15 then r=_____ [1990]
1) 4 2) 8 3)2 4)6

70. In a ΔABC, $a^2+b^2+c^2 = 8R^2$ then triangle is _____ [1990]
1)isosceles 2) right angled 3) equilateral 4) scalene

71. In a triangle, a= 2 , B= 120^0 , C=30^0 the area of riangle is _____ [1990]
1)$\sqrt{2}$ 2)2 3) $\sqrt{3}$ 4) $1/\sqrt{3}$

72. In a Δ ABC a= $\sqrt{3}+1$, B= 30^0, C=45^0 , c = ____ [1991]
1)2 2)3 3)1 4) 0

73. The ex-radii of a triangle r_1,r_2,r_3 are in H.P then sides are in _____ [1993]
1) H.P 2)A.P 3) G.P. 4) A.G.P.

74. If in a ΔABC , x= tan (B-C)/2 tan A/2 , y=tan (C-A)/2 tan B/2 ,
z=tan (A-B)/2 tan C/2 then x+y+z=____ [1993]
1)-xyz 2) yz 3)xyz 4) 1/xyz

75. r =_____ [1994]
1) (s-a) tan B/2 2) (s-b) tan B/2 3) (S-b)tanA/2 4) (S-a) tan C/2

76. In a ΔABC , the line joining then circumcentre to the incentre is parallel to BC then cos B +cos C=_____ [1994]
1)3/2 2)1 3) 3/4 4)1/2

77. If cot A/2 = (b+c)/a then ΔABC is _____ [1994]
1)isosceles 2) equilateral 3) right angled 4) scalene

78. In a ΔABC, tan A/2 = 5/6 , tan C/2 = 2/5 then [1994]
1) a,c,b are in A.P 2) a,b,c are in A.P 3) b,a,c are in A.P 4) a,b,c are in G.P.

79. $\Sigma a^2(\cos^2 B-\cos^2 C)$ =_____ [1995]
1) 0 2)1 3)2 4) 3

80. If acos A = bcos B in Δ ABC,C=____ [1995]
1)45^0 2) 60^0 3) 90^0 4) 150^0

81. The sides of a triangle are 13,14,15.The inradius R of it is _____ [1995]
1)4 2)14 3)2 4) 6

82. If r_1,r_2,r_3 are the ex-radii and r is the inradius of a triangle and 2s is perimeter then $1/r_1+1/r_2+1/r_3$ =_____ [1995]
1)Δ /s 2) 1/r 3) 2/r 4) 3/r

83. In a ΔABC , s=2b then cot A/2 cot C/2 =____ [1997]
1) 2 2)1 3)3 4)√2

84. If the sides of a ΔABC are 6,8,10 then radius of circumcircle is __ [1997]
1) 4 2)3 3) 6 4) 5

85. In ΔABC if A=60^0 then $\frac{b}{c+a} + \frac{c}{a+b}$ =_____ [1997]
1)1 2)2 3)3 4)4

86. In a ΔABC if C= 60^0 then $\frac{a}{b+c} + \frac{b}{c+a}$ =____ [1998]
1)2 2)4 3)3 4)1

87. If area of ΔABC is $a^2-(b-c)^2$ then tanA/2=____ [1998]
1) 1 2) ¼ 3)1/2 4)2

88. In a ΔABC , r [cot B/2 +cotC/2] =_____ [1999]

1)2R 2)b 3)c 4)a

89. In a triangle $r_1 \cot A/2 + r_2 \cot B/2 + r_3 \cot C/2$=____ [1999]
1)2t 2)2R 3)4s 4)3s

90. If in a ΔABC, a,b,c are in A.P then tan A/2 tanC/2 =____ [2000]
1)1/4 2) 1/3 3)1/2 4)4

91. In a ΔABC , cosA+cosB+cosC=____ [2000]
1)1+r/R 2)(1-r)/R 3)(1-R)/r 4)(1+R)/r

92. In ΔABC $r+r_3+r_1-r_2$=____ [2000]
1)4rcosA 2)4RcosB 3) 4RcosC 4) 4R

93. In a ΔABC , $\frac{\cos C+\cos A}{c+a} + \frac{\cos B}{b}$ =___ [2001]
1)1/a 2) 1/b 3) 1/c 4) (c+a)/b

94. In a ΔABC , $a/(b^2-c^2) + c/(b^2-a^2) = 0$ then B=____ [2001]
1) π/2 2) π/4 3) 2π/3 4) π/3

95. $a^2 \sin 2C + c^2 \sin 2A$=____ [2001]
1)Δ 2) 2Δ 3) 3Δ 4) 4Δ

96. The perimeter of a triangle is 16 cms. One of the sides is of length is 6 cm. If the area of the triangle is 12 sq.cm, then the triangle is [2002]
1)right angled 2)isosceles 3)equilateral 4)scalene

97. If the altitudes of a triangle are in arithmetical progression, then the sides of the triangle are in _____ progression [2002]
1)arithmetic 2)harmonic 3)geometric 4)Aasthmetico-geometric

98. If ΔABC is a right angled at A, then r_2+r_3= [2002]
1)r_1-r 2)r_1+r 3)r-r_1 4)R

99. In a ΔABC if b = 20, c = 21 and sinA = 3/5 then a= [2003]
1)12 2) 14 3) 13 4) 15

100. In a ΔABC, $r_1<r_2<r_3$ then [2003]
1) a<b<c 2) a>b>c 3) b<a<c 4) a<c<b

101. In a ΔABC if 3a=b+c then cot B/2cot C/2 =_____ [2003]
1) 1 2) 2 3) 3 4) 4

102. If b+c=3a then cotB/2cotC/2=____ (2003)
1) 1 2) 2 3) 3/4 4) 4/3

103. In a ΔABC, the correct formulae among the following are (2004)

I. $r=4R\sin A/2 \sin B/2 \sin C/2$

II. $r_1=(s-a)\tan A/2$

III. $r_3=\Delta/(s-c)$

1)only I,II 2)only II,III 3)only I,III 4)I,II,III

104. If in a ΔABC, $r_3=r_1+r_2+r$, then $\angle A+\angle B=$____ (2004)

1)120^0 2)100^0 3)90^0 4)80^0

105. In a ΔABC, $(a-b)^2\cos^2(C/2)+(a+b)^2\sin^2(C/2)=$___ (2004)

1)a^2 2)c^2 3)b^2 4)a^2+b^2

106. In a ΔABC, the correct formulae among the following are (2004)

I. $r=4R\sin A/2 \sin B/2 \sin C/2$

II. $r_1=(s-a)\tan A/2$

III. $r_3=\Delta/(s-c)$

1)only I,II 2)only II,III 3)only I,III 4)I,II,III

107. If, in a ΔABC, $r_3=r_1+r_2+r$, then $\angle A+\angle B=$____ (2004)

1)120^0 2)100^0 3)90^0 4)80^0

108. In a ΔABC, $(a-b)^2\cos^2(c/2)+(a+b)^2\sin^2(c/2)=$___ (2004)

1)a^2 2)c^2 3)b^2 4)a^2+b^2

109. Two sides of a triangle are given by the roots of the equation $x^2-5x+6=0$ and the angle betweem the sides is $\pi/3$ then the perimeter of the triangle is (2005)

1)$5+\sqrt{2}$ 2)$5+\sqrt{3}$ 3)$5+\sqrt{5}$ 4)$5+\sqrt{7}$

110. In a ΔABC , $a(\cos^2B+\cos^2C)+\cos A(c\cos C+b\cos B)=$_____ (2005)

1)a 2)b 3)c 4)a+b+c

111. In a Δ ABC, $\sum(b + c)\tan(A/2)\tan[(B-C)/2] =$_____ (2005)

1)a 2)b 3)c 4)0

112. If in a ΔABC, $\tan A/2=5/6$ and $\tan C/2=2/5$, then a, b, c are such that (2006)

1)$b^2= ac$ 2)$2b=a +c$ 3)$2ac= b(a +c)$ 4)$a +b=c$

113. The angles of a triangle are in the ratio 3:5:10, then the ratio of the smallest side to the greatest side is (2006)

1)$1:\sin 10^0$ 2)$1:2 \sin 10^0$ 3)$1:\cos 10^0$ 4)$1:2 \cos 10^0$

114. In a triangle ABC, $\frac{s-a}{\Delta} = \frac{1}{8}$, $\frac{s-b}{\Delta}=\frac{1}{12}$, $\frac{s-c}{\Delta}= \frac{1}{24}$, then b=___ (2006)

1)16 2)20 3)24 4)28

115. In ΔABC, $(a + b + c)\left[\tan\frac{A}{2} + \tan\frac{B}{2}\right] =$ (2007)

1) $2c \cot \frac{C}{2}$ 2) $2a \cot \frac{C}{2}$ 3) $2b \cot \frac{C}{2}$ 4) $\tan \frac{C}{2}$

116. If two angles of a ABC are 45^0 and 60^0, then the ratio of the smallest and the greatest sides are (2007)

1)$(\sqrt{3}-1) :1$ 2) $\sqrt{3}: \sqrt{2}$ 3)$1: \sqrt{3}$ 4) $\sqrt{3}:1$

117. In a triangle ABC if $\frac{1}{b+c} + \frac{1}{c+a} = \frac{3}{a+b+c}$ then C= (2008)

1)90^0 2)60^0 3)45^0 4)30^0

118. In a triangle ABC if $r_1=2r_2=3r_3$ then $\frac{a}{b} + \frac{b}{c} + \frac{c}{a} =$ then C= (2008)

1)75/60 2)155/60 3)176/60 4)191/60

119. Observe the following statements: (2008)

I) In a triangle ABC $b\cos^2\frac{C}{2} + c\cos^2\frac{B}{2} = s$

II) In a triangle ABC $\cot\frac{A}{2} = \frac{b+c}{2} \Rightarrow B = 90^0$

1) Both I, II are true 2) I is true, I is false
3) I is false, I is true 4) Both I, II are false

120. In any Δ ABC, a(b cos C – c cos B) = (2009)

1) $b^2 + c^2$ 2) $b^2 - c^2$ 3) $\frac{1}{b} + \frac{1}{c}$ 4) $\frac{1}{b^2} - \frac{1}{c^2}$

121. In a Δ ABC $\frac{(a+b+c)(b+c-a)(c+a-b)(a+b+c)}{4b^2c^2} =$ (2009)

1) $\cos^2 A$ 2) $\cos^2 B$ 3) $\sin^2 A$ 4) $\sin^2 B$

122. If $\Delta = a^2 - (b-c)^2$, is the area of the triangle ABC, then tan A = (2010)

1) $\frac{1}{16}$ 2) $\frac{8}{15}$ 3) $\frac{3}{4}$ 4) $\frac{4}{3}$

123. In a triangle ABC, $C = 90^\circ$. Then $\frac{a^2 - b^2}{a^2 + b^2} =$ (2010)

1) Sin(A + B) 2) sin(A – B) 3) cos(A + B) 4) cos(A – B)

124. In a triangle ABC if $a\cos^2\frac{C}{2}+c\cos^2\frac{A}{2}=\frac{3b}{2}$, then the side of the triangle are in **(2011)**

1) An arithmetic progression 2) A geometric progression
3) A harmonic progression 4) An arithmetic geometric progression

125. In a triangle ABC if $\frac{\cos A}{a}=\frac{\cos B}{b}=\frac{\cos C}{c}$, then $\sqcup ABC$ is (2011)

1) Right-angled 2) Isosceles right-angled
3) Equilateral 4) Scalene

126. In an acute – angled triangle cotB cotC + cotAcotC + cotAcotB = (2012)

1) – 1 2) 0 3) 1 4) 2

127. If α,β,γ are lengths of the altitudes of a triangle ABC with area Δ, the $\frac{\Delta^2}{R^2}\left(\frac{1}{\alpha^2}+\frac{1}{\beta^2}+\frac{1}{\gamma^2}\right)=$ (2012)

1) $\sin^2A + \sin^2B + \sin^2C$ 2) $\cos^2A + \cos^2B + \cos^2C$
3) $\tan^2A + \tan^2B + \tan^2C$ 4) $\cot^2A + \cot^2B + \cot^2C$

128. In any triangle ABC, $r_1r_2 + r_2r_3 + r_3r_1 =$ (2013)

1) $\frac{\Delta^2}{r^2}$ 2) $\frac{\Delta}{r}$ 3) $\frac{2\Delta}{r}$ 4) Δ^2

129. If, in ΔABC, $\frac{1}{a+c}+\frac{1}{b+c}=\frac{3}{a+b+c}$ then the angle C = (2013)

1) 30^0 2) 45^0 3) 60^0 4) 90^0

130. If any ΔABC, $\frac{(a+b+c)(b+c-a)(c+a-b)(a+b-c)}{4b^2c^2}=$ (2009, 2014)

1) $\cos^2A$ 2) $\cos^2B$ 3) $\sin^2A$ 4) $\sin^2B$

131. If the angles of triangle are in the ratio 1:1:4 then the ratio of the perimeter of the triangle to its largest side is (2014)

1) 3:2 2) $\sqrt{3}+2:\sqrt{2}$ 3) $\sqrt{3}+2:\sqrt{3}$ 4) $\sqrt{2}+2:\sqrt{3}$

132. If in a triangle ABC, $r_1 = 2$, $r_2 = 3$ & $r_3 = 6$ then a = (2014)

1) 1 2) 2 3) 3 4) 4

133. If in a ΔABC, $r_1 = 2r_2 = 3r_3$ then b : c = (2015)

1) 4 : 3 2) 5 : 4 3) 2 : 1 4) 3 : 2

134. In a ΔABC, $\angle c=\frac{\pi}{3}$, then $\frac{3}{a+b+c}-\frac{1}{a+c}=$ (2015)

1) $\frac{1}{a+b}$ 2) $\frac{1}{b+c}$ 3) $\frac{1}{2a+b}$ 4) $\frac{1}{b+2c}$

135. $\Delta ABC,\ \frac{1}{r^2}+\frac{1}{r_1^2}+\frac{1}{r_2^2}+\frac{1}{r_3^2}=$ (2015)

1) $\frac{a^2+b^2+c^2}{\Delta}$ 2) $\frac{a^2+b^2+c^2}{\Delta^2}$

3) $\frac{\Delta^2}{a^2+b^2+c^2}$ 4) $\frac{\Delta}{a^2+b^2+c^2}$

136. The angles of a $\Delta ABC,$ are in an A.P. the larger side a,b satisfying the relation $\frac{\sqrt{3}}{2}<\frac{b}{a}<1,$ then the possible values of the smallest side are (2015)

1) $\frac{a\pm\sqrt{4b^2-3a^2}}{2a}$ 2) $\frac{a\pm\sqrt{4b^2-3a^2}}{2b}$

3) $\frac{a\pm\sqrt{4b^2-3a^2}}{2c}$ 4) $\frac{a\pm\sqrt{4b^2-3a^2}}{2}$

137. In $\Delta ABC,\ \frac{a}{\tan A}+\frac{b}{\tan B}+\frac{c}{\tan C}=$ (2015 A.P.)

1) 2r 2) r + 2R 3) 3r + R 4) 2(r + R)

138. If in a $\Delta ABC,$ $r_1 = 2r_2 = 3r_3$ then the perimeter of the triangle = (2015 A.P.)

1) 3a 2) 3b 3) 3c 4) 3(a + b + c)

139. In a $\Delta ABC,$ (a + b + c)(b + c – a) = $\lambda bc,$ then (2015 A.P.)

1) $\lambda<-6$ 2) $\lambda>6$ 3) $0<\lambda<4$ 4) $\lambda>4$

140. If ΔABC is such that $\angle A=90^0, \angle B\neq C,$ then $\frac{b^2+c^2}{b^2-c^2}\sin(B-C)=$ (2016)

1) $\frac{1}{3}$ 2) $\frac{1}{2}$ 3) 1 4) $\frac{3}{2}$

141. In $\Delta ABC,$ if $8R^2 = a^2 + b^2 + c^2$, then the triangle is a (2016)

1) Right angled triangle 2) Equilateral triangle

3) Scalene triangle 4) Obtuse angled triangle

142. In $\Delta ABC,$ If $2R + r = r_2$, then $\angle B=$ (2016)

1) $\frac{\pi}{3}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{6}$ 4) $\frac{\pi}{2}$

143. In ΔABC, if the sides a, b, c are in geometric progression & the largest angle exceeds the smallest angle by 60^0, then $\cos\beta =$ (2016AP)

1) $\frac{\sqrt{13}+1}{4}$ 2) $\frac{1-\sqrt{13}}{4}$ 3) 1 4) $\frac{\sqrt{13}-1}{4}$

144. In a ΔABC if $\angle A = 90^0$, then $\cos^{-1}\left(\frac{R}{r_2+r_3}\right) =$ (2016AP)

1) 90^0 2) 30^0 3) 60^0 4) 45^0

145. In ΔABC, if $x = \tan\left(\frac{B-C}{2}\right)\tan\frac{A}{2}, y = \tan\left(\frac{C-A}{2}\right)\tan\frac{B}{2}$ & $z = \tan\left(\frac{A-B}{2}\right)\tan\frac{C}{2}$ then (x + y + z) = (2016AP)

1) xyz 2) –xyz 3) 2xyz 4) $\frac{1}{2}xyz$

146. The lengths of the sides of a triangle are 13, 14 & 15. If R & r respectively denote the circum radius & inradius of that triangle, then 8R + r = (2017)

1) 84 2) $\frac{65}{8}$ 3) 4 4) 69

147. In ΔABC, if a = 1, b = 2, $\angle C = 60^0$ then $4\Delta^2 + c^2 =$ (2017)

1) 6 2) 3 3) $\frac{\sqrt{3}}{2}$ 4) 9

148. The sides of a triangle are in the ratio $1:\sqrt{3}:2$. Then the angles are in the ratio(2017)

1) 1:2:3 2) 1:2:4 3) 1:4:5 4) 1:3:5

149. In ΔABC, A : B : C = 5 : 1 : 6 then a : b : c = (2017AP)

1) $\sqrt{2}+1:\sqrt{2}-1:2\sqrt{2}$ 2) $\sqrt{3}-1:\sqrt{3}+1:2\sqrt{2}$

3) $\sqrt{3}+1:\sqrt{3}-1:2\sqrt{2}$ 4) $\sqrt{3}-1:\sqrt{3}+1:1$

150. In any triangle ABC, $a\cos^2\frac{A}{2}+b\cos^2\frac{B}{2}+c\cos^2\frac{C}{2} =$ (2017AP)

1) $\frac{\Delta}{R}$ **2)** $s+\frac{\Delta}{R}$ 3) $2s+\frac{\Delta}{R}$ 4) $\frac{\Delta s}{R}$

151. If $R = \frac{65}{8}, r_1 = \frac{21}{2}, r_2 = 12$ are the circum radius, radii of the excircles opposite to the vertices A & B of a triangle ABC respectively, then the area of the triangle (in square units) is (2017AP)

1) 2/3 2) 28 **3) 84** 4) 168

KEY

1) **1**	2) **4**	3) **3**	4) **1**	5) **3**	6) **1**	7) **2**	8) **2**	9) **1**	10) **2**
11) **3**	12) **4**	13) **1**	14) **3**	15) **2**	16) **4**	17) **4**	18) **2**	19) **4**	20) **1**
21) **3**	22) **4**	23) **1**	24) **1**	25) **4**	26) **1**	27) **1**	28) **1**	29) **3**	30) **2**
31) **3**	32) **1**	33) **3**	34) **1**	35) **1**	36) **1**	37) **1**	38) **3**	39) **2**	40) **1**
41) **1**	42) **1**	43) **3**	44) **1**	45) **2**	46) **1**	47) **1**	48) **2**	49) **4**	50) **1**
51) **2**	52) **2**	53) **2**	54) **1**	55) **4**	56) **1**	57) **1**	58) **1**	59) **4**	60) **4**
61) **1**	62) **2**	63) **4**	64) **4**	65) **3**	66) **1**	67) **2**	68) **3**	69) **3**	70) **2**
71) **3**	72) **1**	73) **2**	74) **1**	75) **2**	76) **2**	77) **3**	78) **2**	79) **1**	80) **3**
81) **1**	82) **2**	83) **1**	84) **4**	85) **1**	86) **4**	87) **2**	88) **4**	89) **4**	90) **2**
91) **1**	92) **2**	93) **2**	94) **4**	95) **4**	96) **2**	97) **2**	98) **1**	99) **3**	100) **1**
101) **2**	102) **2**	103) **3**	104) **3**	105) **2**	106) **3**	107) **3**	108) **2**	109) **4**	110) **1**
111) **4**	112) **2**	113) **4**	114) **1**	115) **1**	116) **1**	117) 2	118) **4**	119) **2**	120) **2**
121) **3**	122) **2**	123) **2**	124)	125) 3	126) 3	127) 1	128) 1	129) 3	130) 3
131) **2**	132) **3**	133) **1**	134) 2	135) 2	136) 4	137) 4	138) 2	139) 3	140) 3
141) **1**	142) **4**	143) **4**	144) 3	145) 2	146) 4	147) 1	148) 1	149) 3	150) 2
151) **3**	152)	153)	154)	155)	156)	157)	158)	159)	160)

AIEEE PROBLEMS

1. In a triangle ABC, medians AD and BE are drawn. If $AD = 4$, $\angle DAB = \pi/6$, $\angle ABE = \pi/3$ then the area of ΔABC is [2003]
   1) 8/3 2) 16/3 3) $32/3\sqrt{3}$ 4) 64/3

2. The sides of a triangle are sin α, cos α and $\sqrt{1+\sin\alpha\cos\alpha}$ for some $0 < \alpha < \frac{\pi}{2}$. Then the greatest angle of the triangle is [2004]
   1) 60^0 2) 150^0 3) 120^0 4) 90^0

3. In ΔABC, if $a\cos^2\frac{C}{2} + c\cos^2\frac{A}{2} = \frac{3b}{2}$ then a, b, c are in [2003]
   1) A.P. 2) G.P. 3) H.P. 4) none

4. In a triangle ABC, let $\angle C = \pi/2$. If r is the inradius and R is the circumstradius of the triangle ABC, then $2(r+R) =$ [2005]
   1) b+c 2) $a+b$ 3) $a+b+c$ 4) $c+a$

5. If in a triangle ABC, the altitudes from the A, B, C on opposite sides are in H.P., then sin A, sin B, sin C are in [2005]
   1) G.P. 2) A.P. 3) Arithmetic–Geometric Progression 4) H.P.

KEY

1) 3 2) 3 3) 1 4) 3 5) 2

Exercise-B

1. In any triangle ABC, $(a-b)^2 \cos^2 C + (a+b)^2 \sin^2 C/2 =$
   1)a^2 2)b^2 3)c^2 4) 1

2. The value of $b \cos^2 c/2 + C \cos^2 B/2$ in a triangle ABC is
   (1) S (2)Δ (3)S (4) 2 Δ

3. In a triangle ABC if a = 3, b = 4 and SinA = 3/4 then angle B =
   (1) 180° (2) 42° (2) 36° (4) 90°

4. If a = 13, b =14 and e = 15 then the area of the triangle is
   (1) 21 Sq units (2) 84 Sq units (3) 60 Sq units (4)46 Sq units

5. If the sides of a triangle are 18, 24 and 30 then its circum radius is
   (1) 15 (2) 20 (3) 25 (4) 30

6. In a triangle ABC, $a = 17, b = 10, c = 1$ then r =
   (1) $2/7$ (2) $7/2$ (3) 6 (4) 12

7. The sides of a triangle are $\sin\alpha$,$\cos\alpha$ and $\sqrt{1+\sin\alpha\cos\alpha}$ for $0<\alpha\ \frac{\pi}{2}$ then the greatest angle of the triangle is
   1)60^0 2)150^0 3)120^0 4)90^0

8. In Δ ABC, a cos A=b cosB then the triangle is
   1)right angled Isosceles 2)right angled but not isosceles
   3)isosceles but not right angles 4) none

9. The smallest angle of the triangle whose sides are 6+√12, √48, √24 is
   1)π/3 2)π/6 3)π/2 4)π/4

10. If $c^2=a^2+b^2$,2s=a+ b+ c then 4s(s-a)(s-b)(s-c)=
    1)s^4 2)b^2c^2 3)a^2c^2 4)a^2b^2

11. In an equilateral triangle $r:R:r_1$
    1)1:2:3 2)2:1:3 3)3:1:2 4)none

12. If the sides of a triangle are 13,14,15 radius of its incircle is
    1)65/8 2)65/4 3)4 4)24

13. The diameter of the circum circle of the triangle whose sides are 61,,60,11 is
    1)60 2)61 3)65 4)70

14. In ΔABC a=√3+1,B=30^0 and C=45^0 then c=

1)c=2 2)c=5 3)c=4 4)none

15. The ex-radii of a triangle r_1,r_2,r_3 are in harmonic progression then the sides a, b, c are in
1)H.P 2)A.P 3)G.P d)none

16. In a ΔABC, r=
1)(s-a)TanB/2 2)(s-b)TanB/2 3)(s-b)Tanc/2 4)(s-a)Tanc/2

17. In a triangle ABC, TanA/2=5/6,Tanc/2=2/5 then
1)a, c, b are in A.P 2)a, b, c are in A.P
3)b, a, c are in A.P 4)a, b, c are in G.P.

18. If cotA/2=(b+ c)/2 then the triangle ABC is
1)isosceles 2)eqilateral 3)right angles 4) None

19. The value of $\Sigma a^2(\cos^2 B-\cos^2 c)$ is
1)0 2)1 3)2 4)3

20. In a ΔABC if s=26 then cotA/2cotc/2=
1)2 2)1 3)3 4) √2

21. If the sides of a triangle are 6,8,10 units, then the radius of circumcircle is
1)4 2)3 3)6 4)5

22. In a triangle ΔABC if $c=60^0$ then a/b+c +b/c+a =
1)2 2)4 3)3 4)1

23. acosA+6cosB+ccosC=
1)0 2) Δ 3)Δ/R 4)2Δ /R

24. If the angles of a Δ are in the ratio 1:2:3 then the sides are in the ratio
1)1:2:3 2)3:2:1 3 3)1: √3:2 4)1: √2:3

25. If a: b: c=7:8:9 then cos A : cos B: cos c=
1)7:8:9 2)14:11:6 3)9:8:7 4)6:11:14

26. In an equilateral Δ the radii of the incircle, circumcircle, and excirlcle are in the ratio
1)1:2:3 2)2:;3:4 3)1:3:2 4)1:1:1

27. If $r^1=r^2=r^3$ then the triangle is
1)equilateral 2)right angles 3)isosceles 4)none

28. If a=13,b=14,c=15 then R=
1)17/4 2)33/4 3)49/4 4)65/8

29. If a=7cm, b=7√3 in ΔABC right angle at c. Then b=
1)30^0 2)60^0 3)90^0 4)120^0

30. If A=30^0,c=10 in Δ ABC right angles at c. Then b=
1)5 2)5√3 3)10 4)none

31. The inradius of the triangle whose sides are 3,5,6 is
1) √8/7 2) √8 3) √7 4) √7/8

32. A=120^0,C=30^0.b=2 then a=
1)2√3 2)2 3) √3/2 4)1/2

33. If the sides are 7, 5, 3 then the greatest angle is
1)60^0 2)90^0 3)120^0 4)150^0

34. $1/r_1+1/r_2+1/r_3=$
1)r 2)1/r 3)r^2 4)$1/r^2$

35. A=30^0, c=7√3,C=90^0 then a= , b=
1)7√3/2,21/2 2)5√3/2,21/4 3)7√3/5,21/4 4)none

36. Match the following

I. If a=5,A=30^0 then	a)A=120^0
II. If a=8,b=15,c=17 then	b)r=R
III. If b=c=r then	c)R=17/2
IV.In an equilateral triangle	d)R=5
	e)r=R/2

1)e,b,d,c 2)b,a,c,d 3)a,d,b,a 4)d,c,a,e

37. A : There is no triangle ABC for A=$Tan^{-1}2$,B=$Tan^{-1}3$.
R : If x>0,y>0 and xy>1 then $Tan^{-1}x+Tan^{-1}y=\pi+Tan^{-1}[(x+y)/1-xy]$
1)A is true, R is true and R is correct explanation of A
2)A is true, R is true and R is not correct explanation of A
3)A is true, R is false 4) A is false, R is true

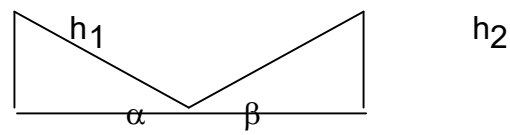
KEY

1) 3	2) 3	3) 4	4) 2	5) 1	6) 2	7) 3	8) 1	9) 2	10) 4
11) 1	12) 3	13) 2	14) 1	15) 2	16) 2	17) 2	18) 3	19) 1	20) 1
21) 4	22) 4	23)	24)	25)	26)	27)	28)	29)	30)
31)	32)	33)	34)	35)	36) 4	37) 4	38)	39)	40)

15. HEIGHTS AND DISTANCES

1. If h_1 and h_2 are heights of 2 towers, α and β are angles of elevation from mid point of the line joining the towers to h_1 and h_2 respectively then

$$\frac{h_1}{h_2} = \frac{\tan\alpha}{\tan\beta}$$

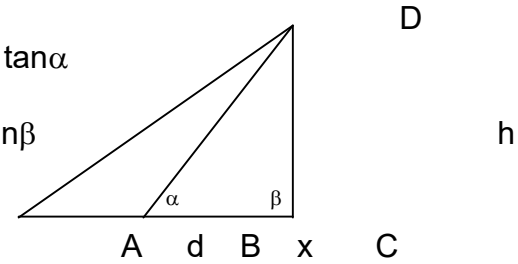


2. The angle of elevation of top of a tower, standing on a horizontal plane, from a point A is α. After walking distance 'd' metres towards the foot of the tower, the angle of elevation is found to be β.

The height of the tower or $h = \dfrac{d}{\cot\alpha - \cot\beta}$ or $h = \dfrac{d\sin\alpha\sin\beta}{\sin(\beta-\alpha)}$

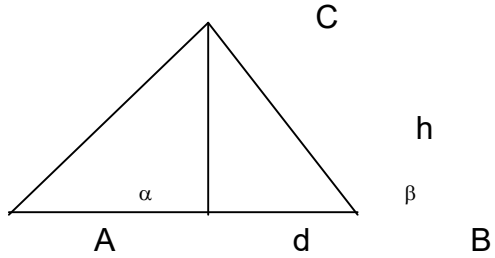
or $h = \dfrac{\tan\alpha\tan\beta}{\tan\beta - \tan\alpha}$

and $x = h/\tan\beta$



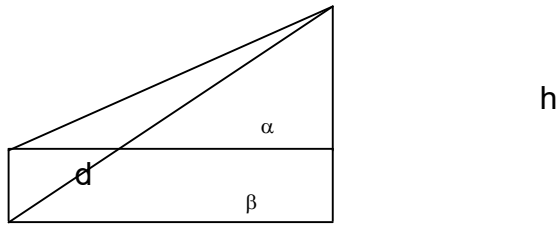
3. If the points of observation A and B lie on either side of the tower, then height of the tower

$h = \dfrac{d\sin\alpha\,\mathrm{Sin}\,\beta}{\mathrm{Sin}\,(\alpha+\beta)}$ (or) $h = \dfrac{d}{\cot\alpha + \cot\beta}$



4. The angles of elevation of the top of a tower from the bottom and top of a building of height 'd' meters are β and α respectively. The height of the tower is

$h = \dfrac{d\sin\beta\cos\alpha}{\mathrm{Sin}\,(\beta-\alpha)}$ or $h = \dfrac{d\cot\alpha}{\cot\alpha - \cot\beta}$



5. The angle of elevation of a cloud from height ‘d’ meters above the level of water in a lake is ‘α’ and the angle of depression of its image in the lake is β.The height of the cloud from the water level in meters is

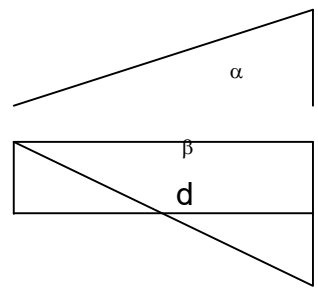
$$h = \frac{d \sin(\beta + \alpha)}{\sin(\beta - \alpha)}$$

(or)

$$h = \frac{d(\tan\beta + \tan\alpha)}{(\tan\beta - \tan\alpha)}$$

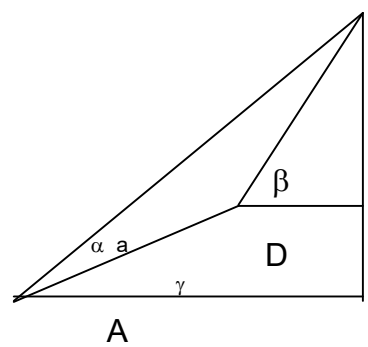
(or)

$$h = d\,\frac{\cot\alpha + \cot\beta}{\cot\alpha - \cot\beta}$$



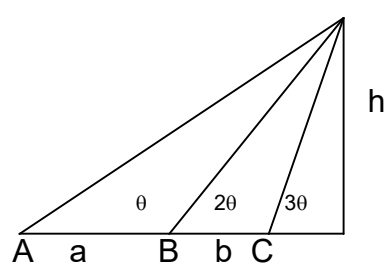
6. The angle of elevation of hill from a point A is ‘α’ after walking to some point D at a distance ‘a’ meters from A on a slope inclined at ‘γ’ to the horizon, the angle of elevation was found to be β.

Height of the hill $h = a\,\frac{\sin\alpha \sin(\beta-\gamma)}{\sin(\beta-\alpha)}$

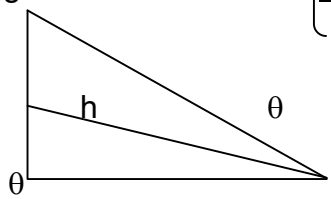


7. A balloon is observed simultaneously from the three points A, B,C on a traight road directly beneath it . the angular elevation at B is twice that at A and the angular elevation at ‘C’ is thrice that at A. If AB=a and BC=b then the height of the balloon h in terms of a and b is

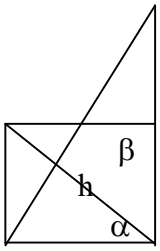
$$h = (a/2b)\sqrt{(3b-a)(a+b)}$$



8. A flagstaff stands on the top of a tower of height h meters. If the tower and flag staff subtend equal angle α at distance 'd' meters from the foot of the tower, then the height the flag-staff in meters is h $\left(\frac{d^2+h^2}{d^2-h^2}\right)$



9.



x

If x is the height of a tower whose angles of elevation from bottom and top of a building of height h meters are α and β respectively then $x=\frac{h\tan\alpha}{\tan\beta}$

Exercise-A

1. From the top of a cliff 24m height, a man observes the angle of depression of a boat is to be 60^0. The distance of the boat from the foot of the cliff is _____
1) $\sqrt{3}$ m 2) $8\sqrt{3}$m 3) $8/\sqrt{3}$m 4) 8m

2. A kite is flying with the string inclined at 30^0 to the horizon. The height of the kite from the ground, when the string is 15m long is_____
1)15m 2) 30 m 3) 15/2m 4) 2/15 m

3. If the shadow of a tower is $\sqrt{3}$ times of its height, the altitude of the sun is _____
1)0^0 2) 30^0 3) 45^0 4) 60^0

4. The angle of elevation of the top of a flag when observed from a point, distance 60 m from its foot is 30^0.Height of the flag is_____
1) $20\sqrt{3}$ 2) $20/\sqrt{3}$ 3) 20 4) $\sqrt{3}/20$

5. From the top of the tree, a man observes the angle of depression of a point which is at a distance of 40m to be 75^0. Height of tree is_____
1)$2+\sqrt{3}$ 2)$40\ (2+\sqrt{3})$ 3) $40/\ (2+\sqrt{3})$ 4) $40\ (2-\sqrt{3})$

6. A person standing at a pt 'A' finds the angle of elevation to the top of the tower as 30^0. After walking 40 m near to the tower angle is 60^0. Find height of the tower.

1)$20\sqrt{3}$ 2) $20/\sqrt{3}$ 3) $\sqrt{3}/20$ 4)20

7. A person standing on one bank of river observes an angle of elevation of the top of tree which is on the other side of river as 45^0. After walking 60m away from the river, angle changed to 30^0. Find the height of the tree.
1) $30(\sqrt{3}+1)$ 2) $30(\sqrt{3}-1)$ 3) $30/(\sqrt{3}+1)$ 4) $30/(\sqrt{3}-1)$

8. A person standing on the bank of a river observes that the angle subtended by a tree on the opposite bank is 60^0. When he retired 40 m from the bank $\perp$ to it he finds 30^0. Find breadth of river and height of tree.
1)$20\sqrt{3}$m& $\sqrt{3}$ m respectively 2) $20/\sqrt{3}$m &20m respectively.
3) 20m and $20\sqrt{3}$m respectively 4) 1/20 m and 20m respectively.

9. From the top of a cliff 200m above the sea-level the angles of depression of two boats, in the same vertical plane as the observer are 45^0 and 30^0. Distance between boats is _____
1)$200(\sqrt{3}+1)$ 2) $200(\sqrt{3}-1)$ 3) $20/(\sqrt{3}+1)$ 4) $20/(\sqrt{3}-1)$

10. At a certain point the angle of elevation of a tower is $\cot^{-1}(3/5)$. On walking 32m directly towards the tower it is $\cot^{-1}(2/5)$. Height of tower is _____
1)100 m 2) 120m 3) 160m 4) 32m

11. From the top of a tower 80 m high, angles of depression of two points P and Q in the same vertical plane with the tower are 45^0 and 75^0. PQ=_____
1)$80(\sqrt{3}+1)$ 2) $80(\sqrt{3}-1)$ 3) $80\sqrt{3}$ 4) $80/\sqrt{3}$

12. The angle of elevation of a cloud from a point h meter above the level of water in a lake is θ and the angle of depression of its image in the lake is ϕ. Height of cloud is ___
1)$h[\sin(\phi+\theta)]/[\sin(\phi-\theta)]$ 2)$h\sin(\theta-\phi)/\sin(\theta+\phi)$
3) $h\tan(\theta+\phi)/\tan(\theta-\phi)$ 4)$h\cot(\theta+\phi)/\cot(\theta-\phi)$

13. The angle of elevation of the top of a tower is 45^0 from a point 10m above the level of water in a lake. The angle of depression of its image in the lake is 60^0. Height of tower is
1)$10(\sqrt{3}+2)$ 2) $200(\sqrt{3}-1)$ 3) $20/(\sqrt{3}+1)$ 4) $20/(\sqrt{3}-1)$

14 From the mid-pt of line joining two towers, first tower of height 100m is making an angle of 30^0 and 2nd is making 60^0 . Height of second tower is_____
1) 100m 2) 100/3m 3) 300m 4) 303m

15. Two towers of equal heights are making 30^0 and 60^0 angles of elevation at a point A which is in between 2 towers. Find height of towers if distance between 2 towers is 100m.
1)25 2)25√3 3) 25/√3 4) √3

16. The angles of elevation of the top of a tower from two points at distant 64 and 49 m from the base and in the same straight line with it are complementary. Height of tower is
1)56m 2) 64m 3) 49 m 4) 65m

17. The angles of elevation of a tower from 2 points distant h_1 and h_2 from foot of tower on the same side are complementary. Find height of tower.
1) h1h2 2) h_1/h_2 3) h_2/h_1 4) $\sqrt{h_1h_2}$

18. The angles of elevation of a pole at a point B,10m vertically above A are 45^0 and 30^0 respectively and height of pole is 5√3 M then M=_____
1) √3 2) √3 +1 3) √3 -1 4) 2√3

19. A tower of 10m height standing at centre of a square with sides of length 2m makes the same angle at each of the four corners. Cotθ=_____
1)1/5√2 2) 5√2 3) √2 4) √2/5

20. From the top of a cliff 60m high, angle of depression of top and bottom of a tower are 30^0,60^0.Height of tower is
1)20m 2)40m 3)50m 4)60m

21. The top of a hill observed from the top and bottom of a building of height h is at angles of elevation p & q respectively. Height of hill is
1)hcotp/(cotp+cotq) 2)hcotp/(cotp-cotq)
3)cotp/(cotp-cotq) 4)cotq/cotp+cotq

22. If a flag-staff of 6m height placed on the top of a tower throws a shadow of 2√3m along the ground then the angle (in degrees) that the sun makes with the ground is
1)45^0 2) 30^0 3)60^0 4)90^0

23. The horizontal distance between towers is 60m and the angular depression of the top of the first as seen from second which is 150m high is 30^0.Height of first tower is
1)150-20√3 2)150+20√3 3)150+√3 4)150-√3

24. A ladder rests against a wall at an angle α to the horizontal. Its foot is pulled away from the wall through a distance a, so that it slides a distance b down the wall making an angle β with the horizontal then a=_____
1)a= tan(α+ β) 2) a=btan(α+β)/2 3)a=btan(α-β)/2 4)a=btan(α-β)

25. A ladder rests against a wall at angle of 60^0 to the horizontal. Its foot is pulled away from the wall through a distance a meters so that it slides a distance 10m down the wall making 30^0, then a = ___
1)10m 2) 100 m 3) 20m 4) 30m

26. A man observes a hill from two points distance √3cm from each other. Find the height if angle of elevation of the hill to be 30^0 and 60^0.
1) √3/2 2) 3/2 3) 2/√3 4)2 /3

27. A man observes a tower AB of height h from a point p on the ground. He moves a distance d towards foot of the tower and finds angle is double. He further moves a distance 3d/4 in same direction and find angle is 3 times that at P. Then $36h^2$ = __
1)d^2 2) 35 d^2 3) $36d^2$ 4) $18d^2$

28. At the foot of a mountain the angle of elevation of a summit is found to be 45^0.After ascending 1km towards the mountain upon a slope of inclination 30^0 ,the angle of elevation is found to be 60^0.Height of the mountain is _____
1)500(√3+1) 2) 100(√3+1) 3)500 4) 100

29. At the foot of a mountain the angle of elevation of a summit is found to be 45^0.After ascending 200m towards the mountain upon a slope of inclination 15^0, the angle of elevation is found to be 60^0.Height of the mountain is _____
1)100(√3+1) 2) 100(√6+√2) 3)500(√6+√2) 4) 100

30. Over a tower AB of height 10m there is a flagstaff BC.If AB,BC make equal angles at a point 15m from the foot A of the tower, the height of flag staff is ____
1) 24m 2) 25m 3) 26m 4) 28m

PREVIOUS EAMCET PAPERS PROBLEMS

31. A flagstaff on the top of a tower 80 m high subtends an angle $\tan^{-1}$ (1/9) at a point on the ground 100m from the foot of the tower. Height of flag staff is ____ (1982)
1) 20 2) 80 3) 40 4) 60

32. The angles of elevation of a cliff at a point A on the ground and at a point B 100m vertically above A are α and β respectively. Height of cliff is _____ (1986)
1) 100cotβ/(cotβ-cotα) 2)cotα/(cotα+cotβ)
3)100/(cotα-cotβ) 4)100/(cotα+cot β)

33. From the top of a building 60m high, angle of elevation of the top of a tower is equal to the angle of depression of the foot of the tower. Height of the tower in meters is [1997]
1)100 m 2) 70m 3) 120m 4) 105m

34. Two vertical poles of height 5m and 9m are separated by a distance of 3m. What is the length of wire required to join the top of two poles. (2000)
1)5m 2)4m 3)3m 4)2m

35. The angles of elevation of the tops of two vertical towers as seen from the mid-poin of the line joining the foot of the towers are 60^0, 30^0 . The ratio of heights of the tower is (1986,2000)
1)2:1 2) √3:1 3) 3:2 4) 3:1

36. The shadow of a tower standing on a level ground is found to be 60m longer when the sun's altitude is 30^0 then when it is 45^0 , height of tower is ____ (2001)
1)30 2) 30(√3 -1) 3) 30 √3 4) 30 (√3 +1)

37. From a point on the level ground, the angle of elevation of the top of a pole is 30^0.On moving 20m nearer the angle of elevation is 45^0.Then the pole height is [2002]
1)10(√3-1) 2)10(√3+1) 3)15 4)20

38. A tower subtends angles α, 2α, 3α at A, B, C all lying on a horizontal line through the foot of the tower. AB/BC=____ (2003)
1)$\frac{\sin 3\alpha}{\sin 2\alpha}$ 2)1+2cos2α 3)2+cos3α 4)$\frac{\sin 2\alpha}{\sin\alpha}$

39. An aeroplane flying with uniform speed horizontally one kilometer above the ground is observed at an elevation of 60^0. After 10 seconds if the elevation is observed to be 30^0, then the speed of the plane (in km/hr.) is (2004)
1)240/√3 2)200√3 3)240√3 4)120/√3

40. A tower of x meters high, has a flagstaff at its top. The tower and the flagstaff subtend equal angles at a point distant y metres from the foot of the tower. Then the length of the flagstaff in metres is (2005)
1)$y(x^2-y^2)/(x^2+y^2)$ 2)$x(y^2+x^2)/(y^2-x^2)$
3)$x(x^2+y^2)/(x^2-y^2)$ 4)$x(x^2-y^2)/(x^2+y^2)$

41. The elevation of an object on a hill is observed form a certain point in the horizontal plane through its base, to be 30^0. After walking 120 meters towards it on level ground the elevation is found to be 60^0. Then thel height of the object(in meters) is (2006)
1)120 2)60√3 3)120√3 4)60

42. The angle of elevation of an object from a point P on the level ground is α. Moving d metres on the ground towards the object, the angle of elevation is found to be β. Then the height (in metres) of the objects is (2007)
1) d tan α 2) d cot β 3) $\frac{d}{\cot\alpha+\cot\beta}$ 4) $\frac{d}{\cot\alpha-\cot\beta}$

43. From the top of the hill h meters high the angle of depressions of the top and the bottom of a pillar are α and β respectively. The height of the pillar is (2008)

1) $\frac{h(\tan\beta - \tan\alpha)}{\tan\beta}$ 2) $\frac{h(\tan\alpha - \tan\beta)}{\tan\alpha}$

3) $\frac{h(\tan\beta + \tan\alpha)}{\tan\beta}$ 4) $\frac{h(\tan\beta + \tan\alpha)}{\tan\alpha}$

44. P is a point on the segment joining the feet of two vertical poles of heights *a* and *b*. The angles of elevation of the tops of the poles from P are 45^0 each. Then the square of the distance between the tops of the poles is: (2009)

1) $\frac{a^2 + b^2}{2}$ 2) $a^2 + b^2$ 3) $2(a^2 + b^2)$ 4) $4(a^2 + b^2)$

45. The sum of angles of elevation of the top of a tower from two points distant a and b from the base and in the same straight line with it is 90°. Then the height of the tower is : (2010)

1) a^2b 2) ab^2 3) $\sqrt{ab}$ 4) ab

46. The angle of elevation of a stationary cloud a point 2500m above a lake is 15^0 and from the same point the angle of depression of its reflection in the lake is 45^0. The height (in meters) of the cloud above the lake that $\cot 15^0 = 2 + \sqrt{3}$ is (2011)

1) 2500 2) $2500\sqrt{2}$ 3) $2500\sqrt{3}$ 4) 5000

47. A vertical pole subtends an angle $\tan^{-1}\left(\frac{1}{2}\right)$ at a point P on the ground. If the angles subtended by the upper half and the lower half of the pole at P are respectively α *and* β then $(\tan\alpha, \tan\beta) =$ (2012)

1) $\left(\frac{1}{4}, \frac{1}{5}\right)$ 2) $\left(\frac{1}{5}, \frac{2}{9}\right)$ 3) $\left(\frac{2}{9}, \frac{1}{4}\right)$ 4) $\left(\frac{1}{4}, \frac{2}{9}\right)$

48. A person observes the top of a tower from a point A on the ground. The elevation of the tower from this point is 60^0. He moves 60 m in the direction perpendicular to the line joining A & base of the tower. The angle of elevation of the tower from this point is 45^0. Then the height of the tower (in meters) is (2013)

1) $60\sqrt{\frac{3}{2}}$ 2) $60\sqrt{2}$ 3) $60\sqrt{3}$ 4) $60\sqrt{\frac{2}{3}}$

KEY

1) 2	2) 3	3) 2	4) 1	5) 2	6) 1	7) 1	8) 3	9) 2	10) 3
11) 2	12) 1	13) 1	14) 3	15) 2	16) 1	17) 4	18) 2	19) 1	20) 2
21) 2	22) 3	23) 1	24) 2	25) 1	26) 2	27) 2	28) 1	29) 2	30) 3
31) 1	32) 1	33) 3	34) 1	35) 4	36) 4	37) 2	38) 2	39) 3	40) 2
41) 2	42) 4	43)1	44) 3	45) 3	46) 3	47) 3	48) 1		

AIEEE PROBLEMS

1. A person standing on the bank of a river observes that the angle of elevation of the top of a tree on the opposite bank of the river is 60^0 and when he retires 40 metres away from the tree the angle of elevation becomes 30^0. The breadth of the river is [2004]
   1) 20 m 2) 60 m 3) 40 m 4) 30 m
2. The upper $\frac{3}{4}$ the portion of a vertical pole subtends an angle $\text{Tan}^{-1}\frac{3}{5}$ at a point in the horizontal plane through its foot and at a distance 40m from the foot. A possible height of the vertical pole is [2003]
   1) 20m 2) 40m 3) 60m 4) 80m

KEY

1) 1 2) 2

Exercise-B

1. A person walking along a straight line towards a hill observes at two points distance √3 kms the angles of elevation of the hill to be 30^0 and 60^0. The height of the hill is
   1)3/2km 2)2/3km 3) $\sqrt{2/3}$km 4) √3km
2. The angle of elevation of the top of a tower from a point on the same level as the foot of the tower is 15^0.On moving 100m towards the tower the angle of elevation increases to 30^0. The height of the tower is
   1)50 2)100 3)150 4)200
3. From the top of a cliff 24m height, a man observes the angle of depression of a boat is to be 60^0. The distance of the boat from the foot of the cliff is _____
   1)√3 m **2) 8√3m** 3) 8/√3m 4) 8m
4. A person standing at a pt 'A' finds the angle of elevation to the top of the tower as 30^0. After walking 40 m near to the tower angle is 60^0. Find height of the tower.
   1)20√3 2) 20/√3 3) √3/20 4)20

Coordinate Geometry
16. Coordinate System

1. The distance between the points $A(x_1, y_1)$ and $B(x_2, y_2)$ is $AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y1)^2}$

2. The point which divides the line segment joining the points $A(x_1, y_1)$, $B(x_2, y_2)$ in the ratio $l : m$

   (i) internally is $\left(\frac{lx_2 + mx_1}{l + m}, \frac{ly_2 + my_1}{l + m}\right)$ $(l + m \neq 0)$

   (ii) externally is $\left(\frac{lx_2 - mx_1}{l - m}, \frac{ly_2 - my_1}{l - m}\right)$ $(l \neq m)$

3. Let A, B be two points. The points which divide $\overline{AB}$ in the ratio 1 : 2 and 2 : 1 are called points of trisection of $\overline{AB}$.

4. If $P(x, y)$ lies on the line joining $A(x_1, y_1)$, $B(x_2, y_2)$ then $\frac{x_1 - x}{x - x_2} = \frac{y_1 - y}{y - y_2}$ and P divides $\overline{AB}$ in the ratio $x_1 - x : x - x_2$ that is also equals to $y_1 - y : y - y_2$.

5. x-axis divides the line segment joining (x_1, y_1), (x_2, y_2) in the ratio $-y_1 : y_2$.

6. y-axis divides the line segment joining (x_1, y_1), (x_2, y_2) in the ratio $-x_1 : x_2$.

7. If $D(\alpha_1, \beta_2)$, $E(\alpha_2, \beta_2)$, $F(\alpha_3, \beta_3)$ are the mid points of the sides $\overline{BC}$, $\overline{CA}$, $\overline{AB}$ of ΔABC, then $A = (\alpha_2 + \alpha_3 - \alpha_1, \beta_2 + \beta_3 - \beta_1)$, $B = (\alpha_3 + \alpha_1 - \alpha_2, \beta_3 + \beta_1 - \beta_2)$, $C = (\alpha_1 + \alpha_2 - \alpha_3, \beta_1 + \beta_2 - \beta_3)$.

8. If (x_1, y_1), (x_2, y_2), (x_3, y_3) are three consecutive vertices of a parallelogram, then the fourth vertex is $(x_1 - x_2 + x_3, y_1 - y_2 + y_3)$.

9. If a point P divides the line segment joining the points A, B in the ratio $l : m$, then the point Q which divides $\overline{AB}$ in the ratio $l : -m$ is called harmonic conjugate of P with respect to A and B.

10. The line passing through a vertex and mid-point of its opposite side of a triangle is called a median. The medians of a triangle are concurrent and the point of concurrence is called centroid or centre of gravity of the triangle.

11. Let G be the centroid of ΔABC and D, E, F be the mid points of BC, CA, AB respectively. Then G divides the medians AD, BE, CF in the ratio 2 : 1.

12. The centroid of the triangle formed by the points $A(x_1, y_1)$, $B(x_2, y_2)$, $C(x_3, y_3)$ is $\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}\right)$.

13. If the perpendicular bisectors of the sides of a triangle are concurrent then the point of concurrence is called circumcentre of the triangle.

14. If S is the circumcentre of ΔABC, then $SA = SB = SC$. The circle with centre S and radius SA passes through the three vertices A, B, C of the triangle. The circle is called circumcircle of the triangle. The radius of circumcircle of ΔABC is called circumradius and it is denoted by R.

15. The circumcentre of a right angled triangle is the mid point of the hypotenuse.

16. The altitudes of a triangle are concurrent. The point of concurrent is called orthocenter of the triangle.

17. The orthocenter of a right angled triangle is the vertex at the right angle.

18. The internal bisectors of angles of a triangle are concurrent. The point of concurrence is called incentre. It is denoted by I.

19. If $A(x_1, y_1)$, $B(x_2, y_2)$, $C(x_3, y_3)$ are the vertices of ΔABC and if $a = BC$, $b = CA$, $c = AB$ then Incentre $I = \left[\frac{ax_1 + bx_2 + cx_3}{a+b+c}, \frac{ay_1 + by_2 + cy_3}{a+b+c}\right]$

    Excentre opposite to A is $I_1 = \left[\frac{-ax_1 + bx_2 + cx_3}{-a+b+c}, \frac{-ay_1 + by_2 + cy_3}{-a+b+c}\right]$

    Excentre opposite to B is $I_2 = \left[\frac{ax_1 - bx_2 + cx_3}{a-b+c}, \frac{ay_1 - by_2 + cy_3}{a-b+c}\right]$

    Excentre opposite to C is $I_3 = \left[\frac{ax_1 + bx_2 - cx_3}{a+b-c}, \frac{ay_1 + by_2 - cy_3}{a+b-c}\right]$

20. Orthocenter H, centroid G, circumcentre S of a triangle are collinear and G divides HS in the ratio 2: 1. The line passing through H, G, S is called Euler's line. If the triangle is an equilateral triangle then $H = G = S = I$ where I is the incentre.

21. The area of the triangle formed by the points $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ is $\frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{vmatrix}$.

22. The area of the triangle is denoted by $\frac{1}{2}\left|\sum x_1(y_2 - y_3)\right|$ or $\frac{1}{2}\left|\sum (x_1 y_2 - x_2 y_1)\right|$.

23. The area of the quadrilateral formed by the points $A(x_1, y_1)$, $B(x_2, y_2)$, $C(x_3, y_3)$, $D(x_4, y_4)$ taken in order is $\frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{vmatrix}$.

24. Circumcentre of the right angled triangle ABC, right angled at A is $\frac{B+C}{2}$.

25. Orthocenter of the right angled triangle ABC, right angled at A is A.

26. The incentre of the triangle formed by $(0, 0)$, $(a, 0)$, $(0, b)$ is $\left[\frac{ab}{a+b+\sqrt{a^2+b^2}}, \frac{ab}{a+b+\sqrt{a^2+b^2}}\right]$.

27. If (x_1, y_1), (x_2, y_2) are two vertices of an equilateral triangle, then its third vertex is $\left[\frac{x_1 + x_2 \pm \sqrt{3}(y_1 - y_2)}{2}, \frac{y_1 + y_2 \mp \sqrt{3}(x_1 - x_2)}{2}\right]$.

28. If (x_1, y_1), (x_2, y_2) are extremities of the hypotenuse of a right angled isosceles triangle, then its third vertex is $\left[\frac{x_1 + x_2 \pm (y_1 - y_2)}{2}, \frac{y_1 + y_2 \mp (x_1 - x_2)}{2}\right]$.

29. If (x_1, y_1), (x_2, y_2) are the ends of the base of an isosceles triangle and θ is the angle made by the side with base then the third vertex of the triangle is $\left[\frac{x_1 + x_2 \pm \tan\theta(y_1 - y_2)}{2}, \frac{y_1 + y_2 \mp \tan\theta(x_1 - x_2)}{2}\right]$.

30. The orthocenter of the triangle with vertices $(0, 0)$, (x_1, y_1), (x_2, y_2) is $\left[\frac{y_2(x_1^2 + y_1^2) - y_1(x_2^2 + y_2^2)}{2(x_1 y_2 - x_2 y_1)}, \frac{x_2(x_1^2 + y_1^2) - x_1(x_2^2 + y_2^2)}{2(x_2 y_1 - x_1 y_2)}\right]$

31. The orthocenter of the triangle with vertices $(0, 0)$, (x_1, y_1), (x_2, y_2) is $\left[(y_1 - y_2)\left[\frac{x_1 x_2 + y_1 y_2}{x_2 y_1 - x_1 y_2}\right], (x_1 - x_2)\left[\frac{x_1 x_2 + y_1 y_2}{x_1 y_2 - x_2 y_1}\right]\right] = (K[y_2 - y_1], K[x_1 - x_2])$

where $K = \frac{x_1 x_2 + y_1 y_2}{x_1 y_2 - x_2 y_1}$.

32. If a is a rational number then (i) (a, a), $(-a, -a)$, $\left(-a\sqrt{3}, a\sqrt{3}\right)$ form an equilateral triangle. (ii) $(2a, 4a)$, $(2a, 6a)$, $\left(2a+\sqrt{3a}, 5a\right)$ form an equilateral triangle. (iii) (a, b), $(-a, -b)$, $\left(b\sqrt{3}, -a\sqrt{3}\right)$ form an equilateral triangle.

33. If (x_1, y_1), (x_2, y_2) are two opposite vertices of a square then the other two vertices are $\left[\dfrac{x_1+x_2 \pm (y_1-y_2)}{2}, \dfrac{y_1+y_2 \mp (x_1-x_2)}{2}\right]$.

34. If (x_1, y_1), (x_2, y_2), (x_3, y_3), (x_4, y_4) are four points and

(i) $x_1 + x_3 = x_2 + x_4$; $y_1 + y_3 = y_2 + y_4$

(ii) $\dfrac{y_2-y_1}{x_2-x_1} \times \dfrac{y_3-y_2}{x_3-x_2} = -1$

(iii) $\dfrac{y_3-y_1}{x_3-x_1} \times \dfrac{y_4-y_2}{x_4-x_2} = -1$

then, the figure formed is a

(a) parallelogram if (i) alone is satisfied

(b) rectangle if (i) and (ii) are satisfied

(c) rhombus if (i) and (iii) are satisfied

(d) square if (i), (ii) and (iii) are satisfied

35. Centroid divides each medium of a triangle in the ratio of 2 : 1 from the vertex.

36. The centroid of a triangle is same as the centroid of the triangle formed by the mid points of the sides of the given triangle.

37. In a triangle orthocentre O, centroid G, circumcentre S are collinear and G divides OS in the ratio 2 : 1.

38. The vertices (a, b), (a, d), (c, d) form a right angled triangle.

(i) Its "orthocentre" = (a, b)

(ii) Its "circumcentre" = $\left[\dfrac{a+c}{2}, \dfrac{b+d}{2}\right]$

39. "Orthocentre" of the triangle formed by the points (0, 0), (x_1, y_1), (x_2, y_2) is $\left[\frac{(y_2-y_1)(x_1x_2+y_1y_2)}{x_1y_2-x_2y_1}, \frac{(x_2-x_1)(x_1x_2+y_1y_2)}{-(x_1y_2-x_2y_1)}\right]$

40. "Circumcentre" of the triangle formed by (0, 0), (x_1, y_1) and (x_2, y_2) is $\left[\frac{-(y_1m-y_2^1)}{x_1y_2-x_2y_1}, \frac{x_1m-x_2^1}{x_1y_2-x_2y_1}\right]$ where $l=\frac{x_1^2+y_1^2}{2}$, $m=\frac{x_2^2+y_2^2}{2}$.

41. The "orthocenter" of a right angled triangle is the vertex containing the right angle.

Exercise-A

Choose the correct answer:

I. ***Problems based on the formula*** $\frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{vmatrix}$

1. Find the area of triangle formed by the points (3, 7), (5, –2), (6, 1).
(1) $\frac{15}{2}$ sq. ut. (2) $\frac{29}{2}$ sq. ut. (3) $\frac{2}{15}$ sq. ut. (4) $\frac{2}{29}$ sq. ut.

2. Find the area of triangle formed by the points (2, –3), (5, 1), (0, 6)
(1) $\frac{38}{2}$ sq. ut. (2) $\frac{2}{27}$ sq. ut. (3) $\frac{35}{2}$ sq. ut. (4) $\frac{27}{4}$ sq. ut.

3. Find t if the points (t, 3), (6, 1) and (–1, 2) are collinear.
(1) 8 (2) –8 (3) t (4) 11

4. Find t if the area of triangle formed by the points (5, 6), (t, 2), (3, –1) is 3 sq. ut.
(1) ± 6 (2) –33 (3) $\frac{33}{7}$ (4) $-\frac{33}{4}$

II. ***Problems based on the formula*** $\frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{vmatrix}$

5. Find the area of quadrilateral formed by the points (3, –1), (4, 6), (–3, 2) and (0, 7).
(1) 28 sq. m. (2) 3 sq. m. (3) 18 sq. m. (4) –3 sq. m.

6. Find the area of quadrilateral formed by the points (–3, 7), (0, 6), (5, 1) and (7, 2).
(1) 72 sq. ut. (2) –32 sq. ut. (3) 42 sq. ut. (4) 5 sq. ut.

III. ***Problems based on the formula*** $\sqrt{(x_2-x_1)^2+(y_2-y1)^2}$

7. The distance between the points (0, 0) and ($a \cos \alpha$, $a \sin \alpha$) is
(1) $\sin^2 \alpha$ (2) $a^2 b^2 \alpha$ (3) $a^2 \sin^2 \alpha$ (4) a

8. The distance between the points (2,3) and (-4,5) is
1)$2\sqrt{2}$ **2)$2\sqrt{10}$** 3)$2\sqrt{2}$ 4) $\sqrt{10}$

IV ***Problems based on the formula*** $\left(\frac{lx_2 + mx_1}{l+m}, \frac{ly_2 + my_1}{l+m}\right)$

9. The points of trisection of the line joining points A and B are(2, 3) and(-4,11) find the length of AB (in units)
1)30 2)10 3)20 4)25

10. Find a point which divides the segment joining (5, 7) and (6, 2) in the ratio 3 : 2.
(1) $\frac{5}{6}, \frac{2}{7}$ (2) 2 : 3 (3) $\frac{28}{5}, \frac{2}{5}$ (4) 3 : 2

11. Find the ratio in which $\left(\frac{28}{5}, 4\right)$ divides the segment joining (5, 7) and (6, 2).
(1) 4 : 1 (2) 5 : 2 (3) 7 : 6 (4) 3 : 2

12. Find the ratio in which the points (7, 10) divides the segment joining (5, 7) and (9, 13).
(1) 2 : 3 (2) 1 : 4 (3) 1 : 1 (4) 1 : 2

13. Find the ratio in which the x-axis divides the segment joining $\left(\frac{7}{2}, 5\right)$ and $\left(\frac{11}{3}, -15\right)$.
(1) – 5 (2) 1 : 3 (3) 2 : 3 (4) 5 : 1

14. Find the ratio in which the x-axis divides the segment joining (9, 6) and (5, 2).
(1) – 6 : 7 (2) – 3 : 1 (3) 6 : 5 (4) 1 : 3

15. The centre of a circle is (5, 7) and one extremity is (3, 2) the other extremity is
(1) (7, 12) (2) (12, 7) (3) (–12, 7) (4) (12, –7)

16. Find the points of trisection of the segment joining (3, 7) and (5, 2).
(1) $\left(\frac{11}{3}, \frac{16}{3}\right)$ and $\left(\frac{2}{3}, \frac{1}{3}\right)$ (2) $\left(\frac{11}{3}, \frac{16}{3}\right)$ and $\left(\frac{13}{3}, \frac{11}{3}\right)$
(3) $\left(\frac{1}{5}, \frac{2}{5}\right)$ and $\left(\frac{2}{5}, \frac{3}{5}\right)$ (4) $\left(\frac{1}{7}, \frac{2}{7}\right)$ and $\left(\frac{11}{3}, \frac{16}{7}\right)$

V ***Problems based on the formula*** $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

17. Find the coordinate of the midpoint of the side of the triangle whose vertices are (3, 7), (5, 11), (9, 13).
(1) (4, 9), (7, 12), (6, 10) (2) (4, 12), (9, 7), (6, 10)
(3) (1, 2), (3, 4), (5, 7) (4) (–1, 2), (2, –1), (0, 0)

VI ***Problems based on the formula*** $(x_1 + x_2 - x_3, y_1 + y_2 - y_3)$.

18. The mid-points of the sides of a triangle are (6, 11), (–5, 2) and (0, 7). Find the coordinate of the vertices.
(1) (1, 6), (4, 3), (5, 4) (2) (1, 6), (11, 16), (1, 6)
(3) $\left(\frac{1}{2}, \frac{13}{2}\right), \left(\frac{-5}{2}, \frac{9}{2}\right)$, (3, 9) (4) (1, 3), (5, 2), (6, 7)

19. If the mid-points of the sides of a triangle are (–3, 7), (6, –2), (4, 5). Find the coordinate of the vertices.
(1) (13, –4), (–5, 14), (–1, 0) (2) (–13, 4), (5, –4), (0, 0)
(3) (1, 2), (3, 4), (5, 0) (4) (4, 17), (4, 2) (3, 3)

20. The vertices of a triangle are (7, 3), (–5, 2), and (0, 4). Find the area of triangle formed by joining the mid-points of the sides.
(1) –12 – 7 sq. ut. (2) $\frac{1}{8}$ sq. ut. (3) $\frac{19}{8}$ sq. ut. (4) none

21. The centroid of a triangle *ABC* is (3, 1) and two of its vertices are (–2, 5) and (–3, 2). Find its area?
(1) $\frac{21}{2}$ sq. ut. (2) $\frac{2}{21}$ sq. ut. (3) $\frac{4}{21}$ sq. ut. (4) $\frac{4}{29}$ sq. ut.

22. The centroid of a ΔABC is (1, 2) and two vertices are (3, 5) and (0, 7). Find the third vertex.
(1) 3, 5 (2) 0, –6 (3) 0, 6 (4) 0, 7

23. Find the circumcentre of the triangle formed by (*o*, *o*), (*a*, *o*) and (*o*, *b*).
(1) $\frac{a}{o}, \frac{b}{o}$ (2) *a*, *b* (3) *o* (4) $\frac{a}{2}, \frac{b}{2}$

24. Find the circumcentre of the triangle when vertices *ax* (*a*, *b*), (*c*, *b*) and (*a*, *d*).
(1) $\left(\frac{a+b}{2}, \frac{c+d}{2}\right)$ (2) $\left(\frac{a+c}{2}, \frac{c+d}{2}\right)$ (3) $\left(\frac{a+c}{2}, \frac{b+d}{2}\right)$ (4) $\left(\frac{a}{2}, \frac{b}{2}\right)$

25. Find the circumcentre of the triangle whose vertices are (3, 7), (–3, 7) and (–3, 6).
(1) $\left(\frac{3}{6}, \frac{6}{7}\right)$ (2) $\left(\frac{3}{7}, \frac{-3}{7}\right)$ (3) $\left(0, \frac{13}{2}\right)$ (4) $\left(\frac{-3}{6}, \frac{-3}{7}\right)$

26. Find the circumcentre of the triangle whose vertices are the (5, –11), (11, –5) and (11, 5).

(1) (0, 0) (2) 1 (3) –15 (4) 11

27. Find the circumcentre of the triangle whose vertices are $\left(\frac{7}{2},\frac{13}{2}\right)$, $\left(\frac{-13}{2},\frac{7}{2}\right)$ and $\left(\frac{-7}{2},\frac{13}{2}\right)$.
(1) (1, 2) (2) (2, 1) (3) (4, 1) (4) (0, 0)

28. The point on Y-axis which is equidistance from (6,-1) and (2, 3) is
1)(0,1) 2)(0,1) 3)(0,-3) 4)(0,3)

29. The point on X-axis equidistant from (1,4) and (2,3) is
1)(-1,0) 2) (0,-1) 3) (-2,0) 4) (0,-1)

30. The triangle formed by the points (2,7) (4,-1)& (-2,6) is
1) equilateral 2)right angled 3)isosceles 4)scalene

31. The points (1,1) (-1,-1)& (- $\sqrt{3}$, $\sqrt{3}$) are the vertices of a triangle which is
1) equilateral 2)right angled 3)isosceles 4)scalene

32. The ortho center of the triangle whose vertices are (a,b)(c,b) and(c,d) is
1) (a,b) 2) (c,b) 3) (c,d) 4) (0,0)

33. The ortho center of the triangle whose vertices are (0,0)(0,100)(1000,0) is
1) (100,1000) 2) (10,100) 3) (1,10) 4) (0,0)

34. The incentre of the triangle formed by the points (2,3)(-2,-5)&(-4,6) is
1) (2,1) 2) (3,2) 3) (1,2) 4) (-1,2)

35. The vertices of a triangle are (0,0)($\sqrt{3}$,3)(- $\sqrt{3}$,3) then the incentre is
1) (0,2) 2) (2,0) 3) (1,1) 4) (1,2)

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36. If (3,2),(-3,2),(0,h) are the vertices of an equilateral triangle and h<0, then the value of h is **[EAMCET86]**
1)2-√3 2)2-2√3 3)2-3√3 4)3-2√3

37. The three points (2,-4),(4,-2),(7,1) **[EAMCET 96]**
1)are collinear 2)form an equilateral triangle
3)form a right angle triangle 4)form an isosceles triangle

38. The points D,E,F are the midpoints of the sides $\overline{BC},\overline{CA},\overline{AB}$ if Δ ABC respectively If A=(-2,3),D=(1,-4),E=(-5,2), then F= **[EAMCET 96]**
1)(4,3) 2) 2)(4,-3) 3)(-4,3) 4)(-4,-3)

39. If A=(-3,4),B(-1,-2),C(5,6),D(x,-4) are the vertices of a quadrilateral such. That area of Δ ABD=2[Area of Δ ACD] then x= **[EAMCET 96]**
1)6 2)9 3)69 4)96

40. The vertices of a triangle are (6,6),(0,6) and (6,0).The distance between its Circumcentre and centroid is **[EAMCET 2000]**
1)2√2 2)2 3) √2 4)1

41. The vertices of a triangle are (6,6),(0,6) and (6,0). The distance between its Circumcentre and centroid is **[EAMCET 2000]**
1)2√2 2)2 3) √2 4)1

42. If the point $(x_1+t[(x_2-x_1],y_1+t[y_2-y_1])$ divides the join of (x_1,y_1) and (x_2,y_2) internally, then **[EAMCET 2000]**
1)t<0 2)0<t<1 3)t>1 4)t=1

43. If the point $(x_1+t[(x_2-x_1],y_1+t[y_2-y_1])$ divides the join of (x_1,y_1) and (x_2,y_2) internally, then **[EAMCET 2000]**
1)t<0 2)0<t<1 3)t>1 4)t=1

44. The point P is equidistant from A(1,3),B(-3,5) and C(5,-1). Then PA=
1)5 2)5√5 3)25 4)5√10 **[EAMCET 2003]**

45. The point P is equidistant from A(1,3),B(-3,5) and C(5,-1). Then PA=
1)5 2)5√5 3)25 4)5√10 **[EAMCET 2003]**

46. If the distance between the points (acosθ,a sinθ) and (acosϕ,asinϕ) is 2a, then θ=
1)2nπ±π+ϕ,nεZ 2)nπ+π/2+ϕ,nεZ 3)nπ-ϕ,nεZ 4)2nπ+ϕ,nεZ **[EAMCET 2004]**

47. In the triangle with vertices at A(6,3),B(-6,3) and C(-6,-3) the median through A meets BC at P, the line AC meets the x-axis at Q, while R and S respectively denote the orthocenter and centroid of the triangle then the correct matching of the coordinates of points in list-I to list-II is

List-I	List-II
1)P	A(0,0)
2)Q	B(6,0)
3)R	C(-2,-1)
	D(-6,0)
4)S	E(-6,-3)
	F(-6,3)

	(i)	(ii)	(iii)	(iv)
1)	D	A	E	C
2)	D	B	E	C
3)	D	A	F	C
4)	B	A	F	C

48. The point on the line 3x+4y=5 which is equidistant from (1, 2) and (3, 4) is:[2010]

1) (7, –4) 2) (15, –10) 3) (1/7, 8/7) 4) (0, 5/4)

KEY

1) 3	2) 2	3) 4	4) 1	5) 1	6) 3	7) 2	8) 3	9) 2	10) 4
11) 4	12) 3	13) 4	14) 3	15) 2	16) 2	17) 1	18) 2	19) 1	20) 2
21) 1	22) 3	23) 1	24) 2	25) 4	26) 3	27) 3	28) 3	29) 3	30)2
31)1	32)2	33)4	34)4	35)1	36)3	37)1	38)2	39)3	40)3
41)3	42)2	43)2	44)4	45)4	46)1	47)3	48)2		

1. The points (-5, 12), (-2, -3), (9, -10), (6, 5) taken in order, form **[AIEEE 2002]**

1) parallelogram 2) rectangle 3) rhombus 4) square

2. The centroid of a triangle is (2, 3) and two of its vertices are (5, 6) and (-1, 4). The third vertex of the triangle is **[AIEEE 2002]**

1) (2, 1) **2) (2, -1)** 3) (1, 2) 4) (1, -2)

3. If a vertex of a triangle is (1, 1) and the midpoints of two sides through this vertex are (-1, 2) and (3, 2), then the centroid of the triangle is **[AIEEE 2005]**

1) $\left(-1,\frac{7}{3}\right)$ 2) $\left(\frac{-1}{3},\frac{7}{3}\right)$ **3)** $\left(1,\frac{7}{3}\right)$ 4) $\left(\frac{1}{3},\frac{7}{3}\right)$

4. Let A (h, k), B (1, 1) and C (2, 1) be the vertices of a right angled triangle with AC as its hypotenuse. If the area of triangle is 1, then the set of values which *k* can take is given by **[AIEEE 2007]**

1) (1, 3) 2) (0, 2) **3) (-1, 3)** 4) (-3, -2)

17. Locus

- The set of all points satisfying a given condition or a given property is called a locus or curve.

- The locus of the point which is equidistant from a fixed point and a fixed line is a parabola.

- If $A(a, 0)$ and $B(-a, 0)$ be two points, then the equation of locus of P such that $PA + PB = C$ is $\frac{4x^2}{c^2} + \frac{4y^2}{c^2 - 4a^2} = 1$.

- If $A(0, b)$ and $B(0, -b)$ be two points, then the equation of locus of P such that $PA + PB = C$ is $\frac{4y^2}{c^2} + \frac{4x^2}{c^2 - 4b^2} = 1$.

- If a line segment $\overline{AB}$ subtends a right angle at P, then the locus of P is a "circle", the equation of the locus is $(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$.

- Locus of the point which is equidistant to the coordinate axes is $|x| = |y|$ or $x^2 - y^2 = 0$

- A variable line passes through a fixed point (x_0, y_0) the locus of point which divides the portion between axis in the ratio $m : n$ is $\frac{nx_0}{x} + \frac{my_0}{y} = m + n$.

- The distance from origin to a variable line is a constant p then the locus of the point which divides the portion between the axis in the ratio $m : n$ is $\frac{n^2}{x^2} + \frac{m^2}{y^2} = \frac{(m+n)^2}{p^2}$.

Exercise-A

Choose the correct answer:

1. The locus of the point which is at a distance of 5 units from the origin is
   (1) $x^2 + y^2 = 25$ (b) $x^2 + y^2 = 19$ (c) $x^2 + y^2 = 32$ (d) $x^2 + y^2 = 29$

2. The locus of $P(x, y)$ such that its distance from $A(0, 0)$ is less than 5 units is
   (1) $x^2 + y^2 < 5$ (b) $x^2 + y^2 < 10$ (c) $x^2 + y^2 < 25$ (d) $x^2 + y^2 < 20$

3. The locus of the point which is at a distance of 5 units from x-axis is
   (1) $y^2 + 25 = 0$ (b) $y^2 - 25 = 0$ (c) $y + 25 = 0$ (d) $y - 25 = 0$

4. The locus of the point which is at a distance of 2 units from y-axis is
   (1) $x^2 + 4 = 0$ (b) $x^2 - 4 = 0$ (c) $x + 4 = 0$ (d) $x - 4 = 0$

5. The locus of the point whose distances to the coordinate axes are in the ratio 2 : 3 is
(1) $3x^2 - 4y^2 = 0$ (b) $4x^2 - 3y^2 = 0$ (c) $4x^2 - 16y^2 = 0$ (d) $4x^2 - 9y^2 = 0$

6. The equation of the locus of the point whose distance from x-axis is twice its distance from the y-axis, is
(1) $y^2 = 4x^2$ (b) $4y^2 = x^2$ (c) $y = 3x$ (d) $4x + y = 0$

7. If the distances from P to the points (5, –4), (7, 6) are in the ratio 2 : 3, then the locus of P is
(1) $5x^2 + 5y^2 - 12x - 86y + 17 = 0$ (b) $5x^2 + 5y^2 - 34x + 120y + 29 = 0$
(c) $5x^2 + 5y^2 - 5x + y + 14 = 0$ (d) $5x^2 + 5y^2 + 78x - 40y + 125 = 0$

8. $A(-9, 0)$, $B(-1, 0)$ are two points. If P is a point such that $PA : PB = 3 : 1$, then the locus of P is
(1) $x^2 + y^2 = 9$ (b) $x^2 + y^2 + 9 = 0$ (c) $x^2 - y^2 = 9$ (d) $x^2 - y^2 + 9 = 0$

9. $A(2, 3)$, $B(3, -4)$ are two points. If P is a point such that $PA = 2PB$, then the locus of P is
(1) $5x^2 + 5y^2 - 12x - 86y + 17 = 0$ (b) $5x^2 + 5y^2 - 34x + 120y + 29 = 0$
(c) $5x^2 + 5y^2 - 5x + y + 14 = 0$ (d) $3x^2 + 3y^2 - 20x + 38y + 87 = 0$

10. The point P moves such that the sum of the squares of its distances from two fixed points $A(a, 0)$ and $B(-a, 0)$ is constant and equal to $6a^2$. The locus of P is
(1) $x^2 - y^2 = a^2$ (b) $x^2 - y^2 = 2a^2$ (c) $x^2 + y^2 = 2a^2$ (d) $x^2 + y^2 = a^2$

11. $A(a, 0)$, $B(-a, 0)$ $C(c, 0)$ are three points. The equation of the locus of a point P such that $PA^2 + PB^2 = 2PC^2$ is
(1) $2x = c^2 - a^2$ (b) $cx = c^2 - a^2$ (c) $2cx = c^2 + a^2$ (d) $2cx = c^2 - a^2$

12. The ends of the hypotenuse of a right angled triangle are $(a, 0)$, $(-a , 0)$. The locus of the third vertex is
(1) $x^2 - y^2 = a^2$ (b) $x^2 + y^2 = a^2$ (c) $x^2 + y^2 + a^2 = 0$ (d) $x^2 - y^2 + a^2 = 0$

13. The locus of P such that area of ΔPAB is 12 square units where $A = (2, 3)$ and $B = (-4, 5)$ is
(1) $x^2 + 6xy + 9y^2 + 22x + 66y + 23 = 0$ (b) $x^2 - 6xy + 9y^2 + 22x + 66y + 23 = 0$
(c) $x^2 + 6xy + 9y^2 - 22x - 66y - 23 = 0$ (d) $x^2 - 6xy + 9y^2 - 22x - 66y - 23 = 0$

14. $O(0, 0)$, $A(6, 0)$, $B(0, 4)$ are three points. If P is a point such that area of ΔPOB is twice the area of ΔPOA, then the locus of P is
(1) $x^2 - 9y^2 = 0$ (b) $y^2 - 9x^2 = 0$ (c) $9x^2 - y^2 = 0$ (d) $9y^2 - x^2 = 0$

15. $A(5, 3)$, $B(3, -2)$, $C(2, -1)$ are three points. If P is a point such that the area of the quadrilateral $PABC$ is 10 square unit, then the locus of P is
(1)$16x^2 + 24xy - 9y^2 + 144x + 108y - 76 = 0$

(a) $16x^2 - 24xy + 9y^2 - 144x + 108y - 76 = 0$
(b) $16x^2 + 24xy + 9y^2 - 144x + 108y + 76 = 0$
(c) $16x^2 - 24xy - 9y^2 + 144x + 108y + 76 = 0$

16. $A(2, 3)$, $B(2, -3)$ are two points. The equation to the locus of P such that $PA + PB = 8$ is
(1) $16x^2 + 7y^2 - 64x - 48 = 0$ (b) $16x^2 + 7y^2 - 64x + 48 = 0$
(c) $16x^2 - 7y^2 + 64x - 48 = 0$ (d) $16x^2 - 7y^2 + 64x + 48 = 0$

17. $A(4, 0)$, $B(-4, 0)$ are two points. The locus of P which moves such that $PA - PB = 4$ is
(1) $3x^2 + y^2 = 12$ (b) $3x^2 - y^2 = 12$ (c) $x^2 + 3y^2 = 12$ (d) $x^2 - 3y^2 = 12$

18. The locus of the point $(a \sec \theta, b \tan \theta)$ where $0 \le \theta < 2\pi$ is
(1) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (2) $\sqrt{\frac{x}{a}} + \sqrt{\frac{y}{b}} = 1$ (c) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ (d) $\sqrt{\frac{x}{a}} - \sqrt{\frac{y}{b}} = 1$

19. The locus of the point $(a \cos^3 \theta, b \sin^3 \theta)$ where $0 \le \theta < 2\pi$ is
(1) $(x^2 y)^{2/3} + (xy^2)^{2/3} = 1$ (2) $(x^2 y^2)^{2/3} + (xy^2)^{2/3} = 1$
(3) $\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} = 1$ (3) $\left(\frac{x^2}{a}\right)^{\frac{2}{3}} + \left(\frac{y^2}{b}\right)^{\frac{2}{3}} = 1$

20. If a point $(x, y) = (\tan \theta + \sin \theta, \tan \theta - \sin \theta)$, then the locus of (x, y) is
(1) $(x^2 y)^{2/3} + (xy^2)^{2/3} = 1$ (2) $x^2 - y^2 = 4xy$
(3) $x^2 - y^2 = 12xy$ (4) $(x^2 - y^2)^2 = 16xy$

21. If a point P moves such that its distances from the point $A(1, 1)$ and the line $x + y + 2 = 0$ are equal then the locus of P is
(1) a straight line (2) a pair of straight lines
(3) a parabola (4) an ellipse

22. The equation to the locus of a point which moves so that the sum of its distances from $(3, 0)$ and $(-3, 0)$ is less than 9 is
(1) $20x^2 + 36y^2 < 405$ (2) $2x^2 + 36y^2 > 405$
(3) $36x^2 + 20y^2 < 405$ (4) $36x^2 + 20y^2 > 405$

23. A straight rod of length 9 units slides with its ends A, B always on the x and y axes respectively. The locus of the centroid of ΔOAB is
(1) $x^2 + y^2 = 3$ *(2)* $x^2 + y^2 = 9$ *(3)* $x^2 + y^2 = 1$ *(4)* $x^2 + y^2 = 81$

24. The locus of a point which is at a distance of five units from $(-2,3)$ is a
1) Square 2) rectangle 3) straight line 4) circle

25. The locus of a point which is at distance of four units from X-axis is

1) $x=4$ *2)* $y=4$ *3)* $x^2=16$ *4)* $y^2=16$

26. The distance of a point P from Y-axis is half of its distance from origin. Then the locus of P is
1) $x^2-3y^2=0$ *2)* $3x^2-y^2=0$ *3)* $x^2-2y^2=0$ *4)* $2x^2-y^2=0$

27. The locus of a point whose distance from origin is double its distance from *(1,2)* is
1) $x^2+y^2-4x-8y+10=0$ *2)* $x^2+y^2+4x+8y+10=0$
3) $3(x^2+y^2)-8x-16y-20=0$ *4)* $3(x^2+y^2)-8x-16y+20=0$

28. The locus of a point equidistant from *(-3,1)* and *(7,5)* is
1) $5x+2y-16=0$ *2)* $5x-2y+16=0$
3) $5x+2y+16=0$ *4)* $5x-2y-16=0$

29. *A=(2,0)* and *B=(-2,0)* are two given points. The locus of a point equidistant from A,B is
1*) X-axis* *2) Y-axis* *3)* $y=x$ *4)* $y=-x$

30. The locus of a point which is equidistant from the coordinate axes is
1) $x^2-y^2=0$ *2)* $x^2+y^2=0$ *3)* $x=y$ *4)* $y=-x$

31. The locus of a point equidistant from *A(-a,0)* and *B(a,0)* is
1)A straight line passing through *(a,0)*
2)A line perpendicular to AB at A
3)A line perpendicular to AB at *(-a/2,a/2)*
4) A line perpendicular to AB at the origin

32. The locus of a point P(x,y) whose distance from *(4,3)* is always greater then *2* is
1) $x^2+y^2-8x-6y+21<0$ *2)* $x^2+y^2+8x+6y+21>0$
3) $x^2+y^2-8x-6y-21<0$ *4)* $x^2+y^2-8x-6y+21>0$

33. *A (1, 2)* and *B (-1, 2)* are two fixed points. The locus of *P* such that *PA=nPB*, where $n\neq1$ is a constant is
1) not a circle 2) straight line 3) circle 4) parabola

34. The locus of a point which is collinear with (2,-3) and (6,-1) is
1) $x+2y=8$ *2)* $x-2y=8$ *3)* $2x+y=8$ *4)* $2x-y=8$

35. A(2,3) and B(-1,5) are two given points. Then the locus of P such that PA and PB are perpendicular is
1) $x^2+y^2+x+8y-13=0$ *2)* $x^2+y^2-x-8y+13=0$
3) $x^2+y^2+x-8y-13=0$ *4)* $x^2+y^2-x+8y+13=0$

36. If A=(cost, sint) & B=(sint, -cost), then the locus of the centroid of the triangle OAB(where O is the origin), is

1) $x^2+y^2=0$ *2)* $x+y=2$ *3)* $9(x^2-y2)=2$ *4)* $9(x^2+y^2)=2$

37. A (5, 3) and B (3,-2) are two fixed points. The locus of P so that the area of the triangle PAB is 9 square units, is
1) Circle 2) ellipse 3) straight line 4) pair of straight lines

38. If the area of the triangle formed by the points *(2,3) ,(-3,4)* and *(2,x)* is *5* square units then x is
1)-1 or -5 2)-1 or 5 3)1 OR -5 4) 1 or 5

39. The ends of the hypotenuse of a right angled triangle are (0,6) and (6,0) . The locus of its third vertex is
1) $x^2+y^2+6x+6y=0$ 2) $x^2+y^2+6x-6y=0$
3) $x^2+y^2-6x+6y=0$ 4) $x^2+y^2-6x-6y=0$

40. The equation $x^2-y^2=0$ represents a
1) Circle 2) hyperbola 3) pair of parallel lines
4) Angular bisectors of coordinate axes

41. The locus of point, the sum of whose distances from A(0,2) and B (0,-2) is six units, is
1) Parabola 2) ellipse 3) hyperbola 4) straight line

42. The locus of a point, the difference of whose distances form two fixed points is always constant(which is less than the distance between the points), is a
1) Circle 2) straight line 3) ellipse 4) hyperbola

43. A = (2, 0), B= (-2, 0) are two points. If P is a point such that $PA^2+PB^2=16$, then the locus of P is a
1) Parabola 2) circle 3) ellipse 4) hyperbola

44. Match the following:
I. The Locus of the point $(a\cos^4\theta, b\sin^4\theta)$ is a) $(x^2y)^{2/3}+(xy^2)^{2/3}=1$
II. The Locus of the point $(\tan\theta+\sin\theta, \tan\theta-\sin\theta)$ is b) $x^2/a^2-y^2/b^2=1$

III. The locus of the point(a secθ,btanθ) is c) $\sqrt{x/a}-\sqrt{Y/b}=1$

IV. The locus of the point(cosecθ-sinθ,secθ-cosθ) is d) $\sqrt{x/a}+\sqrt{y/b}=1$
e) $x^2-y^2=16xy$
1)d,a,b,e 2)b,a,d,e 3)b,e,d,a 4)d,e,b,a

45. I: The locus of the point, for which the sum of the squares of distances from the coordinate axes is 25 is $x^2+y^2=25$
II: The locus of the point whose distances to the coordinate axes are in the ratio 2:3 is $4x^2-9y^2=0$
1)Only I is true 2)Only II is true
3)both I and II are true 4)neither I nor II are true

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46. The locus of P such that area of ΔPAB is 12 square units where $A = (2, 3)$ and $B = (-4, 5)$ is **(1989)**
(a) $x^2 + 6xy + 9y^2 + 22x + 66y + 23 = 0$ (b) $x^2 - 6xy + 9y^2 + 22x + 66y + 23 = 0$
(c) $x^2 + 6xy + 9y^2 - 22x - 66y - 23 = 0$ (d) $x^2 - 6xy + 9y^2 - 22x - 66y - 23 = 0$

47. $A(-9, 0)$, $B(-1, 0)$ are two points. If P is a point such that $PA : PB = 3 : 1$ then the locus of P is **(1998)**
(a) $x^2 + y^2 = 9$ (b) $x^2 + y^2 + 9 = 0$ (c) $x^2 - y^2 = 9$ (d) $x^2 - y^2 + 9 = 0$

48. The equation of the locus of the point whose distance from x-axis is twice its distance from the y-axis, is **(1999)**
(a) $y^2 = 4x^2$ (b) $4y^2 = x^2$ (c) $y = 3x$ (d) $4x + y = 0$

49. If a point $(x, y) = (\tan\theta + \sin\theta, \tan\theta - \text{sun}\,\theta)$, then the locus of (x, y) is **(2002)**
(a) $(x^2y)^{2/3} + (xy^2)^{2/3} = 1$ (b) $x^2 - y^2 = 4xy$
(c) $x^2 - y^2 = 12xy$ (d) $(x^2 - y^2)^2 = 16xy$

50. If a point P moves such that its distances from the point $A(1, 1)$ and the line $x + y + 2 = 0$ are equal then the locus of P is **(2005)**
(a) a straight line (b)a pair of straight lines
(c) a parabola (d) an ellipse

51. If the sum of the distances of a point P from two perpendicular lines in a plane is 1 then the locus of P is a **(2008)**
1) rhombus 2)circle 3)st.line 4)pair of st.line

52. The locus of a point that the sum of its distance from the point (0,2)&(0,-2) is 6, is (2011)
1) $9x^2 - 5y^2 = 45$ 2) $5x^2 + 9y^2 = 45$
3) $9x^2 + 5y^2 = 45$ 4) $5x^2 - 9y^2 = 45$

53. The locus of the centroid of the triangle with vertices at $(a\cos\theta, a\sin\theta), (b\sin\theta, -b\cos\theta)$ & (1, 0) is (2014)
1) $(3x - 1)^2 + 9y^2 = a^2 - b^2$ 2) $(3x - 1)^2 + 9y^2 = a^2 + b^2$
3) $(3x + 1)^2 + 9y^2 = a^2 - b^2$ 4) $(3x + 1)^2 + 9y^2 = a^2 + b^2$

54. The locus of the point P which is equidistant from $3x + 4y + 5 = 0$ & $9x + 12y + 7 = 0$ is (2015)
1) a hyperbola 2) an ellipse 3) a parabola 4) a straight line

55. If the equation to the locus of points equidistant from the points (-2, 3), (6,-5) is $ax + by + c = 0$ where $a > 0$ then, the ascending order of a,b,c is (2015 A.P)
1) a, b, c 2) c, b, a 3) b, c, a 4) a, c, b

56. If A(5, -4) & B(7, 6) are points in a plane, then the set of all points P(x, y) in the palne such that AP : PB = 2 : 3 is (2016)
1) A circle 2) A hyperbola 3) An ellipse 4) A parabola

57. Equation of the locus of the centroid of the triangle whose vertices are (acosk, asink), (bsink, -bcosk) & (1, 0), where k is a parameter is (2016AP)
1) $(1 - 3x)^2 + 9y^2 = a^2 + b^2$ 2) $(3x - 1)^2 + 9y^2 = 2a^2 + 2b^2$
3) $(3x + 1)^2 + (3y)^2 = a^2 + b^2$ 4) $(3x + 1)^2 + (3y)^2 = 3a^2 + 3b^2$

58. A(2, 3), B(3, -5) are two vertices of ΔABC. If the centroid of the ΔABC moves on the line $2x + y - 2 = 0$, then the locus of C is (2017AP)
1) $x + 2y + 2 = 0$ 2) $2x + y + 2 = 0$
3) $2x + y - 2 = 0$ 4) $3x + y + 2 = 0$

59. If A = (5, 3), B(3, -2) & a point P is such that the area of the triangle PAB is 9, then the locus of P represents (2017)
1) A circle 2) A pair of coincident lines
3) A pair of parallel lines 4) A pair of perpendicular lines

KEY

1) **1**	2) **3**	3) **2**	4) **2**	5) **4**	6) **1**	7) **2**	8) **1**	9) **4**	10) **3**
11) **4**	12) **2**	13) **3**	14) **1**	15) **2**	16) **1**	17) **2**	18) **3**	19) **3**	20) **4**
21) **3**	22) **1**	23) **2**	24) **4**	25) **4**	26) **3**	27) **4**	28) **1**	29) **2**	30) **1**
31) **4**	32) **4**	33) **3**	34) **2**	35) **2**	36) **4**	37) **1**	38) **4**	39) **4**	40) **4**
41) **2**	42) **4**	43) **2**	44) **4**	45) **3**	46) **3**	47) **1**	48) **1**	49) **4**	50) **3**
51) **1**	52) **3**	53) **2**	54) **4**	55) **2**	**56)1**	**57)2**	**58)2**	**59)3**	

AIEEE Problems

1. If the equation of the locus of a point equatidistant from the points (a_1, b_1) and (a_2, b_2) is $(a_1 - a_2)x + (b_1 - b_2)y + c = 0$ then the value of *c* is **[AIEEE 2003]**
1) $\frac{1}{2}(a_2^2 + b_2^2 - a_1^2 - b_1^2)$ 2) $a_1^2 - a_2^2 + b_1^2 - b_2^2$
3) $\frac{1}{2}(a_1^2 + a_2^2 - b_1^2 - b_2^2)$ 4) $\sqrt{a_1^2 + b_1^2 - a_2^2 - b_2^2}$

2. Locus of centroid of the triangle whose vertices are (a ccost, a sint), (b sint, - b cost) and (1, 0), where *t* is a parameter, is **[AIEEE 2003]**
1) $(3x-1)^2 + (3y)^2 = a^2 - b^2$ 2) $(3x-1)^2 + (3y)^2 = a^2 + b^2$
3) $(3x+1)^2 + (3y)^2 = a^2 + b^2$ 4) $(3x+1)^2 + (3y)^2 = a^2 - b^2$

18. Change of Axes

1. If the origin is shifted to another point without changing the directions of the axes, then that transformation is called Translation of Axes.

2. If the coordinates (x, y) of a point are transformed to (X, Y), when the axes are translated to the point (h, k) then $x = X + h$, $y + Y + k$.

3. The point to which the origin has to be shifted to eliminate x, y terms in $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ is $\left[\frac{hf - bg}{ab - h^2}, \frac{gh - af}{ab - h^2}\right]$, where $(h^2 \neq ab)$.

4. If the axes are rotated through an angle θ about the origin then that transformation is called rotation of axes.

5. The transformation of coordinates when the axes are rotated through angle θ can be obtained from the following transformation table:

θ	X	Y
x	$\cos\theta$	$-\sin\theta$
y	$\sin\theta$	$\cos\theta$

6. The angle of rotation of the axes to eliminate xy term in the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ is $\frac{1}{2}\tan^{-1}\left[\frac{2h}{a - b}\right]$, where $(a \neq b)$.

7. The condition that the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ to take the form $aX^2 + 2hXY + bY^2 = 0$, when the axes are translated, is $abc + 2fgh - af^2 - bg^2 - ch^2 = 0$.

8. The point to which the origin has to be shifted to eliminate first degree terms (x, y terms) in $f = ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ is obtained by solving $\frac{\partial f}{\partial x} = 0$, $\frac{\partial f}{\partial y} = 0$.

9. If x, y terms are eliminated from $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ by shifting the origin to (α, β) then the transformed equation is $ax^2 + 2hxy + by^2 + 2g\alpha + 2f\beta + c = 0$.

10. The point to which the origin has to be shifted to eliminate x and y term in $ax^2 + by^2 + 2gx + 2fy + c = 0$ is $\left(\frac{-g}{a}, \frac{-f}{b}\right)$.

11. The point to which the origin has to be shifted to eliminate x and y term in the equation $a(x - \alpha)^2 \pm b(y - \beta)^2 = c$ is (α, β).

Exercise-A

Choose the correct answer:

1. The coordinates of the point (3, –5) in the new system when the origin is shifted to (–2, 3) is
(1) (–5, 8) (2) (5, –8) (3) (4, 6) (4) (3, 1)

2. If (7, 5) are the coordinates of a point P in the new system when the origin is shifted to (–5, 3), then the original coordinates of P are
(1) (–1, 2) (2) (1, –5) (3) (2, 8) (4) (4, 1)

3. If ($\cos\alpha$, $\cos\beta$) are the new coordinates of a point P when the axes are translated to the point (1, 1) then the original coordinates of P are
(1) $\left(2\cos^2\frac{\alpha}{2}, 2\cos^2\frac{\beta}{2}\right)$ (2) $\left(2\sin^2\frac{\alpha}{2}, 2\sin^2\frac{\beta}{2}\right)$
(3) $\left(2\cos\frac{\alpha}{2}, 2\cos\frac{\beta}{2}\right)$ (4) $\left(2\sin\frac{\alpha}{2}, 2\sin\frac{\beta}{2}\right)$

4. If the point (3, –2) is transformed to (–2, 1) when the origin is shifted to P, then P =
(1) (3, 2) (2) (5, –3) (3) (2, –3) (4) (–1, 2)

5. The point to which the origin should be shifted in order to eliminate x and y terms in the equation $x^2 - y^2 + 2x + 4y = 0$ is
(1) (1, 3) (2) (–4, 3) (3) (–1, 2) (4) (1, –2)

6. The point to which the origin should be shifted in order to eliminate x and y terms in the equation $14x^2 - 4xy + 11y^2 - 36x + 48y + 41 = 0$ is
(1) (1, 3) (2) (–4, 3) (3) (–1, 2) (4) (1, –2)

7. The point to which the origin should be shifted in order to eliminate x and y terms in the equation $2(x - 5)^2 + 3(y + 7)^2 = 10$ is
(1) (2, 0) (2) (5, –7) (3) (2, –1) (4) (2, –3)

8. If the origin is shifted to the point (2, –2), the equation to which the equation $(x - 2)^2 + (y + 2)^2 = 9$ transformed is
(1) $x^2 + y^2 = 9$ (2) $x^2 + 3y^2 = 1$
(3) $x^2 + y^2 - 2x + 6y = 0$ (4) $4x^2 + 9y^2 = 36$

9. The transformed equation of $xy + 2x - 5y - 11 = 0$ when the origin is shifted to the point (5, –2) is
(1) $xy = 1$ (2) $6x^2 + 5xy - 6y^2 = 0$ (3) $xy = 2$ (4) $6x^2 - 5xy + 6y^2 = 0$

10. The transformed equation of $5x^2 + 4xy + 8y^2 - 12x - 12y = 0$ when the axes are transformed to the point $\left(1, \frac{1}{2}\right)$ is

(1) $XY = 1$ (2) $6X^2 + 5XY - 6Y^2 = 0$
(3) $2X^2 + 4XY + 5Y^2 = 22$ (4) $5X^2 + 4XY + 8Y^2 = 9$

11. If the transformed equation of a curve is $X^2 + Y^2 + 4X + 6Y + 12 = 0$ when the axes are translated to the point (2, 3) then the original equation of the curve is
(1) $x^2 + y^2 + 1 = 0$ (2) $x^2 + y^2 - 1 = 0$ (3) $x^2 - y^2 + 1 = 0$ (4) $x^2 - y^2 - 1 = 0$

12. If the transformed equation of a curve is $3X^2 + XY - Y^2 - 7X + Y + 7 = 0$ when the axes are translated to the point (1, 2) then the original equation of the curve is
(1) $3x^2 + xy - y^2 + 15x + 4y + 13 = 0$ (2) $3x^2 + xy - y^2 - 15x + 4y + 13 = 0$
(3) $3x^2 + xy + y^2 - 15x + 4y + 13 = 0$ (4) $3x^2 + xy - y^2 + 15x - 4y + 13 = 0$

13. If the area of a triangle in 5 s.u. then the area of the triangle when the origin is shifted to (2, –1) is
(1) 2 s. u. (2) 3 s. u. (3) 4 s. u. (4) 5 s. u.

14. The origin is shifted to (2, –3). The equation of the curve $y^2 - 4x + 6y + 17 = 0$ has changed to $y^2 = 4ax$ then $a =$
(a) 4 (2) 3 (3) 2 (4) 1

15. If the axes are rotated through an angle 45°, the coordinates of $\left(2\sqrt{2}, -3\sqrt{2}\right)$ in the new system are
(1) $\left(3\sqrt{3}, -5\right)$ (2) (–1, –5) (3) $\left(5\sqrt{3}, -7\right)$ (4) $\left(7, -\sqrt{3}\right)$

16. The angle of rotation of axes in order to eliminate xy term in the equation $2x^2 + \sqrt{3}xy + 3y^2 = 9$ is

(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{4}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{2}$

17. The angle of rotation of axes to remove xy term in the equation $xy = c^2$ is

(1) $\frac{\pi}{12}$ (2) $\frac{\pi}{6}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{4}$

18. The angle of rotation of axes to remove xy term in the equation $3x^2 + 2xy + 3y^2 = 2$ is

(1) $\frac{\pi}{12}$ (2) $\frac{\pi}{6}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{4}$

19. The transformed equation of $x \cos \alpha + y \sin \alpha = P$ when the axes are rotated through an angle α is
(1) $X = P$ (2) $Y = P$ (3) $X + P = 0$ (4) $Y + P = 0$

20. The transformed equation of $7x^2 + 2\sqrt{3}xy + 9y^2 = 8$ when the axes are rotated through an angle $\pi/3$ is

(1) $3X^2 - Y^2 + 2\sqrt{2}Y - 6 = 0$ (2) $5X^2 + 3Y^2 = 5$
(3) $5X^2 + 3Y^2 = 4$ (4) $4X^2 + 3Y^2 = 6$

21. The transformed equation of $x^2 - y^2 = a^2$ when the axes are rotated through an angle $\pi/4$ in clockwise direction is

(1) $2XY + a^2 = 0$ (2) $XY = a^2$ (3) $X^2 - 4Y^2 = a^2$ (4) $2Y^2 - X^2 + a^2 = 0$

22. The transformed equation of $4xy - 3x^2 = a^2$ when the axes are rotated through an angle $\tan^{-1} 2$ is

(1) $2XY + a^2 = 0$ (2) $XY = a^2$ (3) $X^2 - 4Y^2 = a^2$ (4) $2Y^2 - X^2 + a^2 = 0$

23. If the transformed equation of a curve is $9X^2 + 16Y^2 = 144$ when the axes are rotated through an angle 45° then the original equation of the curve is

(1) $25x^2 + 14xy + 25y^2 = 288$ (2) $25x^2 + 14xy - 25y^2 = 288$
(3) $25x^2 - 14xy + 25y^2 = 288$ (4) $25x^2 - 14xy - 25y^2 = 288$

24. If the transformed equation of a curve is $X^2 + 2\sqrt{3}XY - Y^2 = 2a^2$ when the axes are rotated through an angle 60° then the original equation of the curve is

(1) $x^2 + y^2 + a^2 = 0$ (2) $x^2 + y^2 - a^2 = 0$ (3) $x^2 - y^2 + a^2 = 0$ (4) $x^2 - y^2 - a^2 = 0$

25. The angle of rotation of the axes so that the equation $ax + by + c = 0$ may be reduced to the form X = constant is

(1) $\tan^{-1}\frac{b}{a}$ (2) $\tan^{-1}\frac{a}{b}$ (3) $\tan^{-1} a$ (4) $\tan^{-1} b$

26. I: If the point (3, –2) is transformed to (–2, 1) when the origin is shifted to P then $P = (5, -3)$.

II: The coordinates of the point (2, –3) is the new system when the origin is shifted to (–1, 2) are (1, –1).

(1) only I is true (2) only II is true
(3) both I and II are true (4) neither I nor II are true

27. If the transformed equation of $6x^2 + 5xy - 6y^2 = 0$ when the axes are translated to the point (–1, –1) is $6X^2 + 5XY - 6Y^2 - aX + 6Y + c = 0$ then the descending order of a, b, c is

(1) a, b, c (2) b, c, a (3) a, c, b (4) c, a, b

28. The arrangement of the following in ascending order of angle of rotation to eliminate xy term in the following equation

A) $2x^2 + 5xy + 2y^2 + 5x + 7y + 1 = 0$
B) $2x^2 + \sqrt{3}\,xy + 3y^2 = 9$
C) $9x^2 + 2\sqrt{3}xy + 7y^2 = 10$

(1) C, A, B (2) B, A, C (3) A, B, C (4) C, B, A

29. To remove the first degree terms in the following equation origin should be shifted to another point then calculate the new origin for

I. $x^2 - y^2 + 2x + 4y = 0$	A. (5, –7)
II. $4x^2 + 9y^2 - 8x + 36y + 4 = 0$	B. (1, –2)
III. $x^2 + 3y^3 - 2x + 12y + 1 = 0$	C. (–1, 2)
IV. $2(x - 5)^2 + 3(y + 7)^2 = 10$	D. (–1, –2)
	E. (–5, 7)

(1) *d*, *b*, *a*, *e* (2) *e*, *c*, *b*, *d* (3) *c*, *b*, *d*, *a* (4) *d*, *c*, *b*, *a*

30. **A:** The point to which the origin should be shifted in order to remove x and y term in the equation $14x^2 - 4xy + 11y^2 - 36x + 48y + 41 = 0$ is (1, –2)

R: The coordinates of the point the origin has to be shifted to eliminate first degree terms in the equation $f(x, y) = 0$ is obtained by solving the equation $\frac{\partial f}{\partial x} = 0$, $\frac{\partial f}{\partial y} = 0$.

(1)Both **A** and **R** are true and **R** is the correct explanation of **A**.
(2)Both **A** and **R** are true but **R** is not the correct explanation of **A**.
(3)**A** is true but **R** is false
(4)**A** is false but **R** is true

PREVIOUS EAMCET PROBLEMS

31. If the axes are rotated through an angle 45^0 in the positive direction without changing the origin then coordinate of the point (√2,4) in the old system are [2002]

1) (1-2√2, 1+2√2) 2) (1+2√2, 1-2√2) 3) (2√2, √2) 4) (√2, 2)

32. The transformed equation of $x^2 + 6xy + 8y^2 = 10$ when the axes are rotated through an angle $\pi/4$ is (2006)

(1) $15x^2-14xy+3y^2=20$ (2) $15x^2 - 14xy - 3y^2 = 20$
(3) $15x^2 + 14xy + 3y^2 = 20$ (4) $15x^2 - 14xy - 3y^2 = 20$

33. In order to eliminate the first degree terms from the equation $2x^2+4xy+5y^2-4x-22y+7=0$, the point to which origin is to be shifted is [2007]

1)(1,-3) 2) (2,3) 3) (-2,3) 4) (1,3)

34. The transformed equation of $3x^2 + 2xy + 3y^2 = 2$ when the axes are rotated through an angle $\pi/4$ is (2008)

(1) $x^2+2y^2=1$ (2) $2x^2 + y^2 = 1$ (3) $x^2 + y^2 = 1$ (4) $x^2 + 3y^2 = 1$

35. The transformed equation of $x^2 + y^2 = r^2$ when the axes are rotated through 36^0 is [2009]

1) $\sqrt{5}X^2-4XY+Y^2=r^2$ 2) $X^2 + 2XY - \sqrt{Y^2} = r^2$
3) $X^2 - Y^2 = r^2$ 4) $X^2 + Y^2 = r^2$

36. The point (3, 2) undergoes the following three transformations in the order given

i) Reflection about the line y = x

ii) Translation by the distance 1 unit in the positive direction of x – axis

iii) Rotation by an angle $\frac{\pi}{4}$ about the origin in the anticlockwise direction. Then the final position of the point is: [2012]

1) $\left(\sqrt{18},\sqrt{18}\right)$ 2) $\left(-2,3\right)$ 3) $\left(0,\sqrt{18}\right)$ 4) $\left(0,3\right)$

37. The origin is translated to (1, 2). The point (7, 5) in the old system undergoes the following transformation successively.

i) Moves to the new point under the given translation of origin

ii) Translated through 2 units along the negative direction of the new X – axis

iii) Rotated through an angle $\frac{\pi}{4}$ about the origin of new system in the

iv)

v) clockwise direction.

The final position of the point (7, 5) is [2013]

1) $\left(\frac{9}{\sqrt{2}},\frac{-1}{\sqrt{2}}\right)$ 2) $\left(\frac{7}{\sqrt{2}},\frac{1}{\sqrt{2}}\right)$ 3) $\left(\frac{7}{\sqrt{2}},\frac{-1}{\sqrt{2}}\right)$ 4) $\left(\frac{5}{\sqrt{2}},\frac{-1}{\sqrt{2}}\right)$

38. The point P(1, 3) undergoes the following transformations successively

i) Reflection with respect to the line y = x

ii) Translation through 3 units along the positive direction of the X – axis

iii) Rotation through an angle of π / 6 about the origin in the clockwise direction.

The final position of the point P is (2014)

1) $\left(\frac{7}{\sqrt{2}},\frac{-5}{\sqrt{2}}\right)$ 2) $\left(\frac{6+\sqrt{3}}{2},\frac{1-6\sqrt{3}}{2}\right)$ 3) $\left(\frac{6\sqrt{3}-1}{2},\frac{6+\sqrt{3}}{2}\right)$ 4) $\left(\frac{6\sqrt{3}+1}{2},\frac{\sqrt{3}-6}{2}\right)$

39. The equation of a straight line, perpendicular to 3x – 4y = 6 & forming a triangle of area 6 squares units with coordinate axes, is (2014)

1) 4x + 3y = 12 2) 4x + 3y + 24 = 0 3) 3x + 4y = 12 4) x – 2y = 6

40. If the origin of a coordinate system is shifted to $\left(-\sqrt{2},\sqrt{2}\right)$ & then the coordinate system is rotated anticlockwise through an angle 45^0, the point P(1, -1) in the original system has new coordinates. (2015)

1) $\left(\sqrt{2},-2\sqrt{2}\right)$ 2) $\left(0,-2\sqrt{2}\right)$ 3) $\left(0,-2-\sqrt{2}\right)$ 4) $\left(0,-2+\sqrt{2}\right)$

41. The points (2, 3) is first reflected in the straight line y = x & then translated through a distance of 2 units along the positive direction of x – axis. The coordinates of the transformed point are (2015 A.P.)

1) (5, 4) 2) (2, 3) 3) (5, 2) 4) (4, 5)

42. If the axes are rotated anticlockwise through an angle 90^0 then the equation $x^2 = 4ay$ is changed to the equation. (2016)

1) $y^2 = 4ax$ 2) $x^2 = -4ay$ 3) $y^2 = -4ax$ 4) $x^2 = 4ay$

43. If the coordinate axes are rotated through an angle $\frac{\pi}{6}$ about the origin, then the transformed equation of $\sqrt{3}x^2 - 4xy + \sqrt{3y^2} = 0$ is (2017)

1) $\sqrt{3}y^2 + xy = 0$ 2) $x^2 - y^2 = 0$

3) $\sqrt{3}y^2 - xy = 0$ 4) $\sqrt{3}y^2 - 2xy = 0$

44. Let A = (2, 0) & B = (6, 4) be two points. If $\overline{AB}$ is rotated about A through an angle of 45^0 in the negative direction, then the co – ordinates of B after the rotation are (2017AP)

1) $\left(2+4\sqrt{2},0\right)$ 2) $\left(2,4\sqrt{2}\right)$ 3) $\left(0,4\sqrt{2}\right)$ 4) $\left(4\sqrt{2},0\right)$

45. In order to eliminate the first degree terms from the equation $4x^2 + 8xy + 10y^2 - 8x - 44y + 14 = 0$ the point to which the origin has to be shifted is (2017)

1) (-2, 3) 2) (2, -3) 3) (1, -3) 4) (-1, 3)

KEY

1) **2**	2) **3**	3) **1**	4) **2**	5) **3**	6) **4**	7) **2**	8) **1**	9) **1**	10) **4**
11) **2**	12) **2**	13) **4**	14) **4**	15) **4**	16) **2**	17) **3**	18) **4**	19) **1**	20) **3**
21) **1**	22) **3**	23) **3**	24) **3**	25) **1**	26) **1**	27) **1**	28) **1**	29) **3**	30) **1**
31) **1**	32) 3	33) 3	34) 2	35) **4**	36) **3**	37) **3**	38) **3**	39) **1**	40) **3**
41) **3**	42) 1	43) 3	44) 1	45) **1**	46)	47)	48)	49)	50)

19. STRAIGHT LINE

1. Equation of the line in standard form is $ax + by + c = o$.
2. Equation of the line having slope 'm' and passing through the point (x_1, y_1) is $y - y_1 = m(x - x_1)$.It is known as point slope form.
3. Equation of a line whose slope is 'm' and y intercept is 'c' $y = mx + c$ .It is known aslope intercept form.
4. Equation of a line having slope m and x intercept 'a' is y=m (x-a).
5. Equation of the line passing through the points (x_1, y_1) and (x_2, y_2) is $(x_1-x_2)(y-y_1) = (y_1-y_2)(x-x_1)$.It is known as two point form.
6. Equation of the line having x intercept a and y – intercept b is $\frac{x}{a} + \frac{y}{b} = 1$
7. The area of the triangle formed by coordinate axis and the line $\frac{x}{a} + \frac{y}{b} = 1$ is $\frac{1}{2}|ab|$ sq units.
8. The area of the triangle formed by the coordinate axis and the line ax+by+c=0 is $\frac{c^2}{2ab}$ sq units.
9. If a=b then the line $\frac{x}{a} + \frac{y}{b} = 1$ encloses maximum area with the co-ordinate axes.
10. The figure formed by the lines ax+by +c=0 (or) |ax|+|by| +c=0 is a rhombus and its area is $\frac{2c^2}{ab}$ sq units.
11. If p is the length of the perpendicular from origin to the line and α is the inclination of the perpendicular, then the equation of the line is $x\cos\alpha + y\sin\alpha = p$ $(0^0 \le \alpha < 360^0)$.It is known as normal form or perpendicular form.
12. Equation of the line through the point (x_1, y_1) and having an inclination 'θ' is $(x-x_1)/\cos\theta = (y-y_1)/\sin\theta = r$ where r is the distance between any point on the line from the point (x_1, y_1).It is known as symmetric form.
13. Parametric equations of the line through the point and having an inclination 'θ' are $x = x_1 + r\cos\theta$, $y = y_1 + r\sin\theta$.
14. The ratio in which the line ax+bx+c =0 divides the line segment joining the points (x_1,y_1) and (x_2,y_2) is $-(ax_1+by_1+c) : (ax_2+by_2+c) = -L_1 : L_2$
15. The points (x_1,y_1) and (x_2,y_2) lie on the same side of L if L_1 and L_2 have the same sign.
16. The points lie on opposite side of L if L_1 and L_2 have opposite sign.
17. The perpendicular distance from a point $P(x_1 , y_1)$ to the line ax +by +c =0 is $\frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$.

18. The perpendicular distance from origin to the line ax +by+c =0 is $\frac{|c|}{\sqrt{a^2+b^2}}$.

19. The equation of line passing through (x_1, y_1) and making an angle α with the line y = mx +c is $y-y_1 = \tan(\theta\pm\alpha)(x-x_1)$ where m =tanθ.

20. The line passing through $P(x_1,y_1)$ makes an angle θ with the positive direction of X-axis and meets the line L ≡ ax +by+ c =0 at Q then PQ = $\left|\frac{L_{11}}{a\cos\theta + b\sin\theta}\right|$.

21. The point on the line with slope a/b and passing through $A(x_1,y_1)$ that are k units away from A are $\left(x_1 \pm \frac{kb}{\sqrt{a^2+b^2}}, y_1 \pm \frac{ka}{\sqrt{a^2+b^2}}\right)$.

22. The number of lines that can be drawn through the point P at a distance d units from the point Q is (i) 0 if PQ< d (ii) 1 if PQ = d (iii) 2 if PQ > d.

22. If (h,k) is the foot of the perpendicular from (x_1, y_1) to the line ax +by+c=0 then

$(h-x_1)/ a = (k-y_1) / b = -(ax_1+by_1+c)/(a^2+b^2)$

23. If (h,k) is the image from (x_1, y_1) to the line ax +by+c=0 then

$(h-x_1)/ a = (k-y_1) / b = -2(ax_1+by_1+c)/(a^2+b^2)$

24. The image of the line lx+my+n = 0 with respect to ax+by+c =0 is $(a^2+b^2)(lx +my+n)-2(la +mb)(ax+by+c) =0$

25. Reflection ax+by+c=0 in the line lx+my+n =0 is $(ax+by+c) / (l^2+m^2)-2 (la +mb) (lx+my+n=0)$

26. Reflection of ax+by +c=0 in x-axis is ax-by+c = 0

27. Reflection of a x+by+c =0 in y-axis is –ax+by+c = 0

28. Reflection of ax+by+c =0 in x=y is bx+ay+c = 0

29. Reflection of y = k w.r.t . x-axis is y = -k

30. Reflection of x = k w.r.t y – axis is x = -k

31. Length of intercept of the line ax+by+c=0 between the axes is $\frac{c}{ab}\sqrt{a^2+b^2}$.

32. The lines $a_1x+b_1y+c_1=0$, $a_2x+b_2y+c_2=0$ are

a) Coincident if $a_1 / a_2 = b_1 /b_2 = c_1 /c_2$

b) Parallel if $a_1/a_2 = b_1/b_2 \neq c_1/c_2$

c) Perpendicular if $a_1a_2+b_1 b_2= 0$

d) Intersect if $a_2b_2 - a_2b_1 \neq 0$ and point of intersection

$= [(b_1c_2-b_2c_1) /(a_1b_2-a_2b_1) , (c_1a_2-c_2a_1)/(a_1b_2-a_2b_1)]$

33. Point of intersection of the lines x/a + y/b = 1 and x/b + y/a = 1 is [ab/(a+b) , ab/(a+b)]

34. The equation of the line parallel to ax+by+c=0 and at a distance 'd' from the line is $ax+by+c + (c \pm d\sqrt{a^2+b^2}) =0$

35. The distance between two parallel lines $ax+by+c_1=0$ and $a_2x+by+c_2 =0$ is

$| c_1-c_2| / \sqrt{a^2+b^2}$

36. Area of the parallelogram formed by the lines $a_1x+b_1y+c_1=0$, $a_1x+b_1y+d_1=0$, $a_2x+b_2y+c_2=0$, $a_2x+b_2y+d_2=0$ is $|(c_1-d_1)(c_2-d_2)/(a_1b_2-a_2b_1)|$

37. The area of the triangle formed by the lines $y=m_1x+c_1$, $y=m_2x+c_2$ and $y=m_3x+c_3$ is $\frac{1}{2}\left|\Sigma\frac{(c_1-c_2)^2}{m_1-m_2}\right|$

38. Area of the triangle formed by the lines $a_1x+b_1y+c_1=0$, $a_2x+b_2y+c_2=0$, $a_3x+b_3y+c_3=0$ is $\frac{1}{2}\left|\sum\frac{(b_1c_2-b_2c_1)^2}{b_1b_2(a_1b_2-a_2b_1)}\right|$

39. Area of the triangle formed by the line passing through (x_1,y_1) and (x_2,y_2) with the coordinate axis is $(x_1y_2-x_2y_1)^2/[2|(x_1-x_2)(y_1-y_2)|]$sq units.

40. The Circumcentre of the triangle whose vertices are (a,b), (a,c), (d,b) is ((a+d)/2, (b+c)/2).

41. The equation of perpendicular bisector of the line segment joining (x_1,y_1) and (x_2,y_2) is $2x(x_1-x_2)+2y(y_1-y_2)=(x_1^2+y_1^2)-(x_2^2+y_2^2)$

42. Equation of a line passing through (x_1,y_1) and making equal intercepts on coordinate axes is $x+y=x_1+y_1$

43. If θ is the acute angle between the lines $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$, then $\cos\theta=\frac{|a_1a_2+b_1b_2|}{\sqrt{a_1^2+b_1^2}\sqrt{a_2^2+b_2^2}}$

44. The equations of the angular bisectors of the two lines $a_1x+b_1y+c_1=0$, $a_2x+b_2y+c_2=0$ are $\frac{a_1x+b_1y+c_1}{\sqrt{(a_1^2+b_1^2)}}=\pm\frac{a_2x+b_2y+c_2}{\sqrt{(a_2^2+b_2^2)}}$

45. The lines $a_1x+b_1y+c_1=0$ and $b_1x+a_1y+c_2=0$ always form an isosceles triangle.

46. The area of the rhombus formed by $ax\pm by\pm c=0$ is $\frac{2c^2}{|ab|}$

Exercise-A

I. Problems based on the formula $m=\tan\theta$.

1. Slope of the line whose inclination is 120° is
(1) $\sqrt{3}$ (2) $-\sqrt{3}$
(3) $\frac{1}{\sqrt{3}}$ (4) $-\frac{1}{\sqrt{3}}$

2. Slope of the line which inclined with the *x*-axis at an angle $\frac{5\pi}{6}$ is
(1) $\frac{1}{\sqrt{3}}$ (2) $-\sqrt{3}$
(3) $\frac{1}{\sqrt{3}}$ (4) $-\frac{1}{\sqrt{3}}$

II. Problem based on the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$.

3. Slope of the line joining the points (–2, 7) and (5, 3) is
(1) $-\frac{4}{7}$ (2) $\frac{4}{7}$
(3) $-\frac{7}{4}$ (4) $\frac{7}{4}$

4. Slope of the line joining the points (a, 0) and (0, b) is
(1) $\frac{a}{b}$ (2) $-\frac{a}{b}$
(3) $\frac{b}{a}$ (4) $-\frac{b}{a}$

III. Problems based on the formula $\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$

5. Equation of the line passing through (–4, –1) and (2, 3) is
(1) $2x - 3y + 5 = 0$
(2) $x + 2y + 1 = 0$
(3) $3x + 7y + 4 = 0$
(4) $x + 9y + 13 = 0$

6. Equation of the line passing through the point (4, 7) and (2, 5) is
(1) $x - y + 3 = 0$
(2) $x - y - 3 = 0$
(3) $x + y + 3 = 0$
(4) $x - y + 2 = 0$

IV. Problems based the formula $y - y_1 = m(x - x_1)$.

7. Equation of the line having slope ½ and passing through (1, 2) is
(1) $2x - y + 3 = 0$
(2) $2x + y + 3 = 0$
(3) $x - 2y + 3 = 0$
(4) $x + 2y + 3 = 0$

8. Equation of the line passing through (–2, 3) and having slope $\frac{3}{4}$ is
(1) $3x + 4y + 18 = 0$
(2) $3x - 4y - 18 = 0$
(3) $3x - 4y + 18 = 0$
(4) $4x - 3y - 18 = 0$

V. Problems based on the formula $y = m(n - a)$

9. Equation of the line having inclination 120° and x-intercept 3 is
(1) (1) $x + \sqrt{3}y - 3\sqrt{3} = 0$
(2) $\sqrt{3}x + y + 3\sqrt{3} = 0$
(3) (3) $x + \sqrt{3}y = 4\sqrt{3}$
(4) $\sqrt{3}x + y - 3\sqrt{3} = 0$

10. Equation of the line having slope 5 and x-intercept 4 is
(1) $5x + y + 20 = 0$
(2) $5x - y - 20 = 0$
(3) $x + 5y + 2 = 0$
(4) $x - 5y - 20 = 0$

VI. Problems based on the formula $y = mx$.

11. Equation of the line having inclination 150° and y-intercept 4 is
(1) $x - \sqrt{3}y = 4\sqrt{3}$
(2) $x + \sqrt{3}y = 4\sqrt{3}$
(3) $\sqrt{3}x - y = 4\sqrt{3}$
(4) $\sqrt{3}x + y = 4\sqrt{3}$

12. Equation of the line having slope $-\frac{4}{5}$ and y-intercept $-\frac{3}{2}$ is
(1) $8x + 10y + 15 = 0$
(2) $4x - 3y + 10 = 0$
(3) $3x + 7y - 5 = 0$
(4) $7x + 5y - 13 = 0$

VII. Problems of perpendicular bisector.

13. Equation of the perpendicular bisector of the line segment joining the points (1, 2) and (3, 4) is
(1) $x + y + 5 = 0$
(2) $x + y + 4 = 0$
(3) $x + y - 5 = 0$
(4) $x + y - 4 = 0$

14. Equation of the perpendicular bisector of the line segment joining the points (–2, 3) and (1, –2) is
(1) $3x - 5y + 4 = 0$
(2) $3x + 5y + 4 = 0$
(3) $3x - 5y - 4 = 0$
(4) $4x - 3y - 1 = 0$

VIII. Problems of length of intercept.

15. Length of the intercept of the line between the axis passing through the points (1, 2) and (3, 4) is
(1) 1 (2) –1
(3) $\sqrt{2}$ (4) $\sqrt{3}$

16. Length of the intercept of the line $4x + 3y + 12 = 0$ between the axis is
(1) 4 (2) 3 (3) 5 (4) 6

IX. Problems on normal form $x \cos \alpha + y \sin \alpha = P$.

17. The normal form of $x + \sqrt{3}y + 1 = 0$ is
(1) $x \cos 240 + y \sin 240 = \frac{1}{2}$
(2) $x \cos 60 + y \sin 60 = 1$
(3) $x \cos 120 + y \sin 120 = \frac{1}{2}$
(4) $x \cos 30 + y \sin 30 = 1$

18. The normal form of $x + y + 2 = 0$ is
(1) $x \cos 225 + y \sin 225 = \sqrt{2}$
(2) $x \cos 45 + y \sin 45 = \sqrt{2}$
(3) $x \cos 135 + y \sin 135 = \sqrt{2}$
(4) $x \cos 315 + y \sin 315 = 1$

X. Problems of parallel lines.

19. Equation of the line parallel to x-axis and passing through (1, 2) is
(1) $x = 0$ (2) $y = 0$
(3) $x = 1$ (4) $y = 2$

20. Equation of the line parallel to y-axis and passing through (–3, –4) is
(1) $x = 0$ (2) $y = 0$
(3) $x + 3 = 0$ (d) $y + 4 = 0$

XI. Problems of ratio.

21. The ratio in which the line $5x - 2y + 10 = 0$ divides the line joining the points (–1, 2) and (3, 5) is
(1) 1 : 15 (2) –1 : 15
(3) 15 : 1 (4) –15 : 1

22. The ratio in which the line $3x + 4y = 8$ divides the line joining the points (0, 0) and (1, 1) is
(1) 8 : 1 (2) –8 : 1
(3) 1 : 8 (4) –1 : 8

XII. Problems of foot of perpendicular.

23. The foot of perpendicular from (3, 4) to the line $3x + 4y + 5 = 0$ is
(1) $\left(\frac{3}{5}, \frac{4}{5}\right)$ (2) $\left(\frac{3}{5}, -\frac{4}{5}\right)$
(3) $\left(-\frac{3}{5}, \frac{4}{5}\right)$ (4) $\left(-\frac{3}{4}, -\frac{4}{5}\right)$

24. The foot of perpendicular from (–4, 5) on the line is (2, –3) then the equation of the line is
(1) $3x + 4y = 18$
(2) $3x - 4y + 18 = 0$
(3) $3x + 4y + 18 = 0$
(4) $3x - 4y = 18$

XIII. Problems based on the formula $\frac{1}{2}|ab|$

25. Area of the triangle formed by the line $3x + 2y + 7 = 0$ with the coordinate axes is
(1) $\frac{25}{16}$ s.u. (2) $\frac{49}{8}$ s.u.
(3) 12 s.u. (4) $\frac{49}{12}$ s.u.

26. Area of the triangle formed by the line $4x - y + 7 = 0$ with coordinate axes is
(1) $\frac{25}{16}$ s.u. (2) $\frac{49}{8}$ s.u.
(3) 12 s.u. (4) $\frac{49}{12}$ s.u.

XIV. Problems based on intercept relation.

27. Equation of the line having intercepts a, b on the axes such that $a + b = 5$, $ab = 6$ is
(1) $x + y = 5$
(2) $3x + 2y - 6 = 0$, $2x+3x-6 = 0$
(3) $x - 3y - 3 = 0$, $3x - y + 3 = 0$
(4) $2x + 10y - 5 = 0$, $10x + 2y - 5 = 0$

28. Equation of the line passing through (2, –7) and having equal intercepts is
(1) $x + y - 1 = 0$
(2) $x - y + 7 = 0$
(3) $x + y + 1 = 0$, $x + 4y - 2 = 0$
(4) $2x + 10y - 5 = 0$, $10x + 2y - 5 = 0$

XV. Problems based on intercept ratios.

29. Equation of the line passing through (0, 1) and having intercepts where ratio is $m : n$ is
(1) $nx + my = m$ (2) $nx + my = 2n$
(3) $nx + my = n$ (4) $nx + my = 2m$

30. Equation of the line passing through (2, 0) and having intercepts where ratio is $m : n$ is

(1) $nx + my = m$ (2) $nx + my = 2n$
(3) $nx + my = n$ (4) $nx + my = 2m$

XVI. Problems based on the formula $\frac{lx}{x_1} + \frac{my}{y_1} = m + n$.

31. The portion of a line intercepted between the coordinate axes is bisected by the point (x_1, y_1). Equation of the line is
(1) $\frac{x}{x_1} + \frac{y}{y_1} = 0$ (2) $\frac{x}{x_1} - \frac{y}{y_1} = 0$
(3) $\frac{x}{x_1} + \frac{y}{y_1} = 2$ (4) $\frac{x}{x_1} - \frac{y}{y_1} = 2$

32. The portion of a line intercepted between the coordinate axes is divided by the point (2, –1) in the ratio 3 : 2 the equation of the line is
(1) $5x - 2y - 20 - 0$
(2) $2x - y + 7 = 0$
(3) $x - 3y - 5 = 0$
(4) $2x + y - 4 = 0$

XVII. Problems based on the formula $\frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$

33. The perpendicular distance from the origin to the line $\frac{x}{p\sec\alpha} + \frac{y}{p\csc\alpha} = 1$
(1) $|p \sin 2\alpha|$ (2) $|p \cos 2\alpha|$
(3) $|p \tan \alpha|$ (4) $|p|$

34. The perpendicular distance from the point $(\cos \alpha, \sin \alpha)$ to the line $x \cos \alpha + y \sin \alpha = p$ is
(1) $|p|$ (2) $|1 - p|$
(3) p^2 (4) $1 / p^2$

XVIII. Problems based on the formula
$$\frac{x - x_1}{\cos\theta} = \frac{y - y_1}{\sin\theta} = \pm 2$$

35. If the straight line through $P(3, 4)$ makes an angle $\pi / 6$ with x-axis and meets the line $12x + 5y + 10 = 0$ at Q then the length of PQ is
(1) $12\sqrt{3} + 5$ (2) 2
(3) $\frac{12}{12\sqrt{3} + 5}$ (4) 132

36. If the straight line through $P(3, 4)$ makes an angle $\pi / 6$ with x-axis and meets the line $3x + 5y + 1 = 0$ at Q then length PQ is
(1) 30
(2) $30(\sqrt{3} - 1)$
(3) $\sqrt{3} - 1$
(4) $15(3\sqrt{30} - 5\sqrt{20})$

XIX. Problems based on the formula $\frac{|c_2 - c_1|}{\sqrt{a^2 + b^2}}$

37. The distance between parallel lines $4x + 3y + 7 = 0$ and $12x + 9y + 1 = 0$ is
(1) $\frac{2}{5}$ (2) $\frac{4}{3}$
(3) $\frac{29}{4\sqrt{13}}$ (4) $\frac{9}{2\sqrt{5}}$

38. The distance between parallel lines $4y - 2x + 1 = 0$ and $x - 2y + 1 = 0$ is

(1) $\frac{3}{2\sqrt{5}}$ (2) $\frac{2}{\sqrt{13}}$

(3) $\frac{11}{2}$ (4) $\frac{4}{\sqrt{5}}$

XX. Problems of types of triangle.

39. The lines $x - 7y - 22 = 0$, $3x + 4y + 9 = 0$, $7x + y - 54 = 0$
(1) form an equilateral triangle
(2) are concurrent
(3) form an isosceles triangle
(4) form a right angled isosceles triangle

40. The lines $2x - y - 1 = 0$, $3x - y - 7 = 0$, $3x - 2y + 4 = 0$
(1) form equilateral triangle
(2) are concurrent
(3) form an isosceles triangle
(4) form a right angled isosceles triangle

XXI. Problems of foot of perpendicular:

41. The foot of the perpendicular from the origin on 3x+4y-25=0 is
1) (3, 4) 2) (8, 6)
3) (-8, 6) 4) (6,-8)

42. The foot of the perpendicular from the point (-2,5) in y+3= 0 is
1) (2,0) 2) (0, -5)
3) (7,-4) **4) (2,-3)**

43. The foot of the perpendicular from the point (2,3) in 4x-5y+8 = 0 is
1) (78/41,128/41)
2) (-78/41,128/41)
3) (78/41,-128/41)
4) (-78/41,-128/41)

44. If (2,-3) is the foot of the perpendicular from (-4,5) on a line , then the equation of the line is
1)3x+4y = 8 **2)3x-4y =18**
3)3x+4y =20 4)3x-4y =20

XXII.Problems of image:

45. The image of the point (-2,3) w.r.t. x-axis is
1)(2,5) 2) (0,5) 3) (3,-4) **4) (-2,-3)**

46. The image of the point (2,-3) w.r.t. y-axis is
1)(2,5) 2) (0,5) 3) (3,-4) **4) (-2,-3)**

47. The image of the point (3,4) w.r.t. line 3x+4y+5=0 is
1)(21/5,28/5) 2) (21/5,-28/5) 3) (-21/5,-28/5) **4) (-21/5,-28/50)**

48. The image of the point (1,2) w.r.t. the line 3x+4y –1 =0 is
1)(7/5,6/5) 2) (7/5,-6/5) 3) (-7/5,6/5) **4) (-7/5,-6/5)**

49. The image of the line 3x-4y+11 =0 w.r.t. 2x-y-1=0 is
1)3x+4y-5=0 2) 4x+3y-5=0 **3) x=3** 4) 5x+12y-2=0

50. The image of the line 2x-y-1 = 0 w.r.t. 3x-2y+4= 0 is

1)22x+19y+77 = 0 **2) 22x-19y+77 = 0** 3) 2x-y+7=0 4) 3x-2y+11=0

XXIII. Problems of point of intersection:

51. The point of intersection of the lines x=-5 and y= 4 is
1)(4,-5) 2)(5,4) 3)(5,-4) **4)(-5,4)**

52. The lines 5x –3y =1 and 3x =2y intersect each other at
1)(2,-3) 2)(-2,3) **3)(2,3)** 4)(-2,-3)

XXIV. Problems of point of concurrence:

53. If the lines 3y+4x=1, y= x+5 and 5y+bx=3 are concurrent then b is
1) 1 2) 3 **3) 6** 4) 0

54. If the lines 4x+3y-1=0,x-y+5=0 and kx+5y-3=0 are concurrent, then k=
1)4 2)5 **3)6** 4)7

55. The point of concurrence of the lines (a+2b)x+(a-b)y+(a+5b)=0 is
1)(-1,2) 2)(2,-1) **3)(-2,1)** 4)(1,-2)

56. The set of lines ax+by+c=0 where 3a +2b+4c=0 are concurrent at the point
1) (3/2, 1/4) 2) (3/4, 1/4) **3) (3/4, 1/2)** 4) (1,2)

57. The lines (a+2b) x+(a-3b) y = a-b for different values of a and b pass through the point
1) (8/5, 3/5) 2) (-2/5, 7/5) **3) (2/5, 3/5)** 4(8/5,-8/5)

58. The straight lines 2x+y+3=0 ; x-2y+4=0 ; 2x+3y+1=0 are
1) Sides of a triangle **2) concurrent** 3) parallel 4) perpendicular

XXV. Problems of equation of bisector:

59. The equation of one of the bisectors bisecting the angles between the lines 3x-4y+7=0 and 12x+5y-2=0 is
1)11x+3y+9=0 **2) 11x-3y+9=0** 3) 11x-3y-9=0 4) x=0

60. The equation of angular bisectors of straight line 2x+y +5 =0 and 2x-y+3 =0 is
1)x+2 =0, y+1 =0 2)x-2 =0,y+1 =0 3)x+2=0,y-1 =0 4)x-2=0,y-1=0

61. The equation of the bisector of the acute angle between the straight line 3x+4y –5 =0, and 5x-12y+1 =0 is
1)x +8y –5 =0 2)x- 8y -5 =0 3)8x-y+5 = 0 4)8x+y+5 =0

62. The equation of the bisector acute angle between the straight lines 3x-4y-5 =0 and 5x-12y+1 =0 is
1) 28x +16y –7 =0 **2)16x-28y -15 =0** 3)16x+20y+15 =0 4)16x-20y = -15

63. The equation of the bisector obtuse angle between the straight lines 3x+4y+2 =0 and 5x-12y-3 =0 is
1)64x -8y +11 =0 2)16x-28y -15 =0 3)16x+20y+15 =0 4)16x-20y = -15

64. The equation of perpendicular bisector of the segment joining (2,-3)&(1,2)
1)2x +10y -8 =0 2)2x-10 y +8 =0 **3)2x-10y-8 =0** 4)2x-10y+8 =0

65. The equation of perpendicular BISECTOR OF THE SEGMENT joining (7,3)&(2,-3)
1)10x +12y -35 =0 2)12x-10 y +8 =0 3)12x-10y-8 =0 4)12x-10y+35 =0

XXVI. Miscellaneous Problems:

66. The equation of the straight line passing through the point of intersection of the lines 3x+2y+2 =0, 5x+y+3 =0 and passing through the origin is
1)x+4y =0 **2)x-4y =0** 3)4x-y =0 4)4x+y =0

67. The equation of the straight line passing through the point of intersection of the lines 2x+3y+4 =0, x+2y+1 =0 and passing through the (1,1) is
1)x+6y+7 = 0 **2)x+6y-7 =0** 3)x-6y+7 =0 4)x+4y-7 =0

68. The equation of the straight line passing through the point of intersection of the lines x+2y+3 =0, 2x+y+1 =0 and passing through the (2,-1) is
1)2x-5y-9=0 2)2x-4y+9 =0 3)4x-y-6 =0 4)4x+y+6 =0

69. The equation of straight passing through the point of intersection of lines 2x+3y-5 =0 4x-y-3 =0 and parallel to line 4x+3y +2 =0 is
1)4x +3y –7 =0 2)4x+3 y +7 =0 3)4x-3y+7 =0 4)4x-3y-7 =0

70. The equation of straight passing through the point of intersection of lines 3x-2y-5 =0, x-2y-3 =0 and parallel to line 4x+y -3 =0 is
1)4x -y +8 =0 **2)4x+ y +8 = 0** 3)4x-3y+8 =0 4)4x-3y-8 =0

71. The equation of straight passing through the point of intersection of lines 2x-y-1 =0 x+2y-3 =0 and perpendicular to line 5x+3y +7 = 0 is
1)3x -5y +2 =0 2)3x+3 y +7 =0 3)3x-3y+7 =0 4)3x+5y+2 =0

72. The orthocentre of the triangle formed by the lines x+2y =0 4x+3y-5 =0 and 3x+y =0 is
1)(4,3) 2)(4,-3) 3)(-4,3) **4)(-4,-3)**

73. The orthocentre of the triangle formed by the lines 4x-7y +10 = 0, x +y-5 = 0 and 7x+4y =15 is
1)(1,2) 2)(1,-2) 3)(-1,2) 4)(-1,-2)

74. Match the following
I. The line passing through the point of intersection of a)3x-y-5=0

5x-2y=12,4x-7y-15=0 and parallel to 3x-2y+5=0

II. The line passing through the point of intersection of x-2y+5=0,3x+2y+7=0 and perpendicular to x-y=0 — b)3x-2y-8=0

III. The line passing through the intersection of x+2y-19=0, x-2y-3=0 and at a distance of 5 unit from (-2,4) is — c)x+y+2=0

IV. The line passing through the point of intersection of 5x-y=9,x+6y=8 and the point (3,4) is — d)5x-12y-7=0

1)b,c,d,a 2)c,b,d,a 3)d,c,b,a 4)a,b,c,d

75. Match the following

I. Centroid of the triangle formed by x+y-7=0	a)(5,5)
II. Circumcentre of the triangle formed by 3x-y-5=0, x+2y-4=0, 5x+3y+1=0 is	b)(1/√2,1/√2)
III.Incentre of the triangle formed by x+y+1=0,x=1 y=1 is	c)(-6/7,2/7)
IV.Orthocentre of the triangle formed by x-2y+9=0, x+y-9=0, 2x-y-9=0 is	d)(8/3,3)

1)b,c,d,a 2)c,b,d,a **3)d,c,b,a** 4)a,b,c,d

PREVIOUS EAMCET PROBLEMS

76. Two vertices of a triangle are (5, –1) and (–2, 3). If the orthocenter is the origin, the coordinates of the third vertex is **(1985)**
(1) (–4, –7) (2) (4, 7) (3) (4, –7) (4) (–4, 7)

77. If a, b, c are in A.P. then the straight lines $ax + 3y + c = 0$ **(1985)**
(1) pass through a fixed point (2) form an equilateral triangle
(3) form a rhombus (4) form a square

78. The circumcentre of triangle with vertices (–2, 3), (2, –1) and (4, 0) is **(1986)**
(1) $\left(\frac{3}{2},\frac{5}{2}\right)$ (2) $\left(\frac{3}{2},-\frac{5}{2}\right)$ (3) $\left(-\frac{3}{2},\frac{5}{2}\right)$ (4) $\left(-\frac{3}{2},-\frac{5}{2}\right)$

79. The angle made by the line joining (5, 2),(6, –15) at (0, 0) is **(1986)**
(1) $\pi/6$ (2) $\pi/4$ (3) $\pi/2$ (4) π

80. The point on the line $2x - 3y = 5$ equidistant from (1, 2) ,(3, 4)is **(1987)**
(1) (2, 3) (2) (4, 1) (3) (1, 1) (4) (4, 6)

81. The circumcentre of the triangle whose sides are $3x - y - 5 = 0$, $x + 2y - 4 = 0$, $5x + 3y + 1 = 0$ is **(1987)**
(1) $\left(-\frac{1}{7},\ \frac{2}{7}\right)$ (2) $\left(-\frac{2}{7},\ \frac{2}{7}\right)$ (3) $\left(-\frac{4}{7},\ \frac{2}{7}\right)$ (4) $\left(-\frac{6}{7},\ \frac{2}{7}\right)$

82. If the point (1, 2) is reflected through origin and then through the line $x = y$, then the new coordinates of the point is **(1988)**
(1) (–2, –1) (2) (–2, 1) (3) (2, –1) (4) (2, 1)

83. The orthocenter of the triangle formed by (1, 0) ,(2, –4), (–5, –2) is **(1989)**
(1) $\left(\frac{11}{13}, \frac{7}{13}\right)$ (2) $\left(-\frac{11}{13}, \frac{7}{13}\right)$ (3) $\left(\frac{11}{13}, -\frac{7}{13}\right)$ (4) $\left(-\frac{11}{13}, -\frac{7}{13}\right)$

84. The equation to the straight line through the intersection of $\frac{x}{a}+\frac{y}{b}=1$ and $\frac{x}{b}+\frac{y}{a}=1$ and (1, 2) is $\frac{x}{a}+\frac{y}{b}-1+\lambda\left(\frac{x}{b}+\frac{y}{b}-1\right)=0$ where λ= **(1989)**
(1) $\frac{2a+b-ab}{2b+a-ab}$ (2) $(y-2)=\frac{ab-2a-2b}{ab-a-b}(x-1)$
(3) $\frac{a+b-ab}{a+b+ab}$ (4) none

85. If the line $3x + 4y = 8$ is denoted by L, then the points (2, –5), (–5, 2) **(1990)**
(1) lie on L (2) lie on the same side of L
(3) lie on opposite sides of L (4) are equidistant from L

86. The orthocenter of the triangle whose sides are $2y – x = 9$, $x + y = 9$, $2x – y = 9$ is **(1991)**
(1) (3, 3) (2) (4, 4) (3) (5, 5) (4) (6, 6)

87. If $A(–1, 1)$, $B(5, 3)$ are the opposite vertices of a square in the xy-plane, the equation of the other diagonal (not passing through A, B) of the square is given by **(1993)**
(1) $x –3y + 4 = 0$ (2) $2x – y + 3 = 0$ (3) $3x + y – 8 = 0$ (4) $x + 2y – 1 = 0$

88. $ABCD$ is a parallelogram. equation of AB and AD are $4x + 5y = 0$ and $7x + 2y = 0$, and the equation of the diagonal BD is $11x + 7y = 9$ then the equation of AC is **(1993)**
(1) $x + y + 1 = 0$ (2) $x + y – 1 = 0$ (3) $x + y = 0$ (4) $x – y = 0$

89. The reflection of the point (4, –13) in the line $5x + y + 6 = 0$ is **(1994)**
(1) (–1, –14) (2) (3, 4) (3) (1, 2) (4) (–4, 13)

90. A point equidistant from the lines $4x + 3y + 10 = 0$, $5x – 12y + 26 = 0$ and $7x + 24y – 50 = 0$ is **(1994)**
(1) (1, –1) (2) (1, 1) (3) (0, 0) (4) (0, 1)

91. The lines $2x + y – 1 = 0$, $ax + 3y – 3 = 0$ and $3x + 2y – 2 = 0$ are concurrent **(1994)**
(1) for all a (2) for $a = 4$ only (3) for $–1 \le a \le 3$ (4) for $a > 0$ only

92. The diagonals of the parallelogram whose sides are $lx + my + n = 0$, $lx + my + n' = 0$, $mx + ly + n = 0$, $mx + ly + n' = 0$ include an angle **(1994)**

(1) $\frac{\pi}{3}$ (2) $\frac{\pi}{2}$ (3) $\tan^{-1}\left(\frac{l^2 - m^2}{l^2 + m^2}\right)$ (4) $\tan^{-1}\left(\frac{2lm}{l^2 + m^2}\right)$

93. The equation to the sides of a triangle are $x - 3y = 0$, $4x + 3y = 5$ and $3x + y = 0$. The line $3x - 4y = 0$ passes through **(1994)**

(1) the incentre (3) the centroid
(c) the circumcentre (4) the orthocenter of the triangle

94. If (–4, 5) is one vertex and$7x - y + 8 = 0$ is one diagonal of a square, then the equation of the second diagonal is **(1996)**

(1) $x + 7y - 11 = 0$ (2) $x + 7y - 21 = 0$ (3) $x + 7y - 31 = 0$ (4)none

95. The angle between the line $x \cos \alpha + y \sin \alpha = P_1$ and $x \cos \beta + y \sin \beta = P_2$ where $\alpha > \beta$ is **(1996)**

(1) $\alpha + \beta$ (2) $\alpha - \beta$ (3) $\alpha\beta$ (4) $2\alpha - \beta$

96. The foot of the perpendicular from the point (3, 4) on the line $3x - 4y + 5 = 0$ is **(1996)**

(1) $\left(\frac{81}{25}, \frac{92}{25}\right)$ (2) $\left(\frac{92}{25}, \frac{81}{25}\right)$ (3) $\left(\frac{46}{25}, \frac{54}{25}\right)$ (4) $\left(-\frac{81}{25}, \frac{92}{25}\right)$

97. The angle between the lines formed by joining the points (2, –3), (– 5, 1) and (7, –1), (0, 3) is **(1996)**

(1) $\pi / 2$ (2) $\pi / 4$ (3) 0 (4) $\pi / 6$

98. The variable line $\frac{x}{a} + \frac{y}{b} = 1$ is such that $a + b = 0$. The locus of the mid point of the portion of the line intercepted between the axes is **(1996)**

(1) $x + y = 0$ (2) $10x + 5y = 1$ (3) $x + y = 5$ (4) $5x + 10y = 1$

99. The nearest point on the line 2x – y + 5 = 0 from the origin is **(1996)**

(1) (2, 1) (2) (2, –1) (3) (–2, 1) (4) (–2, –1)

100. The equation of the line passing through point of intersection of the lines $x - 3y + 2 = 0$ and $2x + 5y - 7 = 0$ and perpendicular to the line $3x + 2y + 5 = 0$ is: **(2006)**

(1) $2x - 3y + 1 = 0$ (2) $6x - 9y - 11 = 0$ (3) $2x - 3y + 5 = 0$ (4) $3x - 2y + 1 = 0$

101. If $2x + 3y + 4 = 0$ is the perpendicular bisector of the segment joining the points $A(1, 2)$ and $B(\alpha, \beta)$ then the value of $\alpha + \beta$ is **(1996)**

(1) $-\frac{81}{13}$ (2) $-\frac{136}{13}$ (3) $-\frac{135}{13}$ (4) $-\frac{134}{13}$

102. If a, b, c are in A. P. then the straight line $ax + by + c = 0$ always passes through a fixed point whose coordinates are **(1996)**

(1) (1, 2) (2) (1, –2) (3) (–1, 2) (4) (–1, –2)

103. Let O be the origin. $A(3, -2)$, $B(1, 2)$ and $C(1, 1)$. The pair of points which are on different sides of the line $2x + 3y = 5$ are **(1996)**

(1) A, B (2) A, C (3) B, C (4) none

104. If the point of intersection of $kx + 4y + 2 = 0$, $x - 3y + 5 = 0$ lies on $2x + 7y - 3 = 0$, then $k =$ **(1997)**

(1) 2 (2) 3 (3) –2 (4) –3

105. A line passing through $A(1, -2)$ has slope 1. The points on the line at a distance of $4\sqrt{2}$ unit from A are **(1997)**

(1) (3, –6) (5, 2) (2) (–3, –6) (5, –2) (3) (–3, –6) (5, 2) (4) (3, 6) (–5, 2)

106. The angle of rotation of axes in order to eliminate xy term in the equation $x^2 + 2\sqrt{3}xy - y^2 = 2a^2$ is **(1998]**

(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{4}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{2}$

107. k is a non-zero constant and $k = \frac{a+b}{ab}$, then the straight line $\frac{x}{a} + \frac{y}{b} = 1$ passes through the point **(1998)**

(1) (k, k) (2) $\left(\frac{1}{k}, \frac{1}{k}\right)$ (3) (1, 1) (4) $\left(k, \frac{1}{k}\right)$

108. Let a and b be non zero real such that $a \neq b$. Then the equation of the line passing through the origin and the point of intersection of $\frac{x}{a} + \frac{y}{b} = 1$ and $\frac{x}{b} + \frac{y}{a} = 1$ is **(1998)**

(1) $ax + by = 0$ (2) $bx + ay = 0$ (3) $y - x = 0$ (4) $x + y = 0$

109. The angle made by the line joining (5, 2), (5, –15) at (0, 0) is **(1999)**

(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{4}$ (3) $\frac{\pi}{2}$ (4) π

110. The perpendicular distance from (1, 2)to the straight line $12x + 5y = 7$ is **(1999)**

(1) $\frac{15}{13}$ (2) $\frac{12}{13}$ (3) $\frac{5}{13}$ (4) $\frac{7}{13}$

111. If the axes are rotated through an angle 30° about the origin then the transformed equation of $x^2 + 2\sqrt{3}xy - y^2 = 2a^2$ is **(1999)**

(1) $x^2 + y^2 = a^2$ (2) $x^2 - y^2 = a^2$ (3) $x^2 + y^2 = 2a^2$ (4) $x^2 - y^2 = 2a^2$

112. The equation of the straight line making an intercept of 3 units on the y-axis and inclined at 45° to x-axis is **(1999)**
(1) $y = x - 1$ (2) $y = x + 3$ (3) $y = 45x + 3$ (4) $y = x + 45$

113. If the straight lines $y = 4 - 3x$, $ay = x + 10$ and $2y + bx + 9 = 0$ represents the three consecutive sides of a rectangle, then $ab =$ **(1999)**
(1)18 (2) -3 (3) $\frac{1}{2}$ (4) $-\frac{1}{3}$

114. The equation of the line passing through the intersection of the lines $x - 2y + 5 = 0$ and $3x + 2y + 7 = 0$ and perpendicular to the line $x - y = 0$ is **(1999)**
(1) $x + y = 0$ (2) $x + y = 2$ (3) $x + y + 2 = 0$ (4) $x + y + 1 = 0$

115. The reflection of the points (6, 8) in the line $x = y$ is **(1999)**
(1) (4, 2) (2) (–6, –8) (3) (–8, 10) (4) (8, 6)

116. A line passing through $A(1, -2)$ has slope 1.118. The points on the line at a distance of $4\sqrt{2}$ units from A are **(2000)**
(1) (3, –6) (5, 2) (2) (–3, –6), (5, –2) (3) (–3, –6), (5, 2) (4) (3, 6), (–5, 2)

117. If the area of the triangle formed by the straight lines $x = 0$, $y = 0$, $3x + 4y = a$, $(a > 0)$ is one, then $a =$ **(2000)**
(1) $5\sqrt{6}$ (2) $4\sqrt{6}$ (3) $3\sqrt{6}$ (4) $2\sqrt{6}$

118. The area of the triangle formed by the axes and the line $(\cos h\alpha - \sin h\alpha)x + (\cos h\alpha + \sin h\alpha)y = 2$ in square units is **(2000)**
(1) 4 (2) 3 (3) 2 (4) 1

119. If a straight line perpendicular to $2x - 3y + 7 = 0$ forms a triangle with the coordinate axes whose area is 3 sq. units, then the equation of the straight line(s) is **(2000)**
(1) $3x + 2y = \pm 2$ (2) $3x + 2y = \pm 6$ (3) $3x + 2y = \pm 8$ (4) $3x + 2y = \pm 4$

120. The coordinate axes are rotated about the origin O in the counter-clockwise direction through an angle 60°. If p and q are the intercepts made on the new axes by a straight line whose equation referred to the original axes is $x + y = 1$, then $\frac{1}{p^2} + \frac{1}{q^2} =$ ___ **(2000)**
(1) 2 (2) 4 (3) 6 (4) 8

121. If the points (1, 2) and (3, 4) were to be on the same side of the line $3x - 5y + a = 0$, then **(2000)**
(1) $7 < a < 11$ (2) $a = 7$ (3) $a = 11$ (4) $a < 7$ or $a > 11$

122. The line $2x + 3y = 6$, $2x + 3y = 8$ cut the x-axis at A, B respectively. A line l drawn through the point (2, 2) meets the x-axis at C in such a way that abscissa of A, B, C are in arithmetic progression. Then the equation of the line l is **(2001)**
(1) $2x + 3y = 10$ (2) $3x + 2y = 10$ (3) $2x - 3y = 10$ (4) $3x - 2y = 10$

123. The number of circles that touch all the straight lines $x + y - 4 = 0$, $x - y + 2 = 0$ and $y = 2$ is **(2001)**
(1) 1 (2) 2 (3) 3 (4) 4

124. For all values of a and b the line $(a + 2b)x + (a - b)y + (a + 5b) = 0$ passes through the point **(2001)**
(1) (–1, 2) (2) (2, –1) (3) (–2, 1) (4) (1, –2)

125. The incentre of the triangle formed by the lines $x + y = 1$, $x = 1$, $y = 1$ is **(2001)**
(1) $\left[1-\frac{1}{\sqrt{2}}, 1-\frac{1}{\sqrt{2}}\right]$ (2) $\left[1-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right]$ (3) $\left[\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right]$ (4) $\left[\frac{1}{\sqrt{2}}, 1-\frac{1}{\sqrt{2}}\right]$

126. If (–2, 6) is the image of the point (4, 2) with respect to the line $L = 0$, then $L =$ **(2002)**
(1) $6x - 4y - 7$ (2) $2x + 3y - 5$ (3) $3x - 2y + 5$ (4) $3x - 2y + 10$

127. The total number of circles that can be drawn touching all the three line $x + y - 1 = 0$, $x - y - 1 = 0$, $y + 1 = 0$ is **(2004)**
(1) 1 (2) 2 (3) 3 (4) 4

128. Suppose A, B are two points on $2x - y + 3 = 0$ and $P(12)$ is such that $PA = PB$. Then the mid point of AB is **(2004)**
(1) $\left(-\frac{1}{5}, \frac{13}{5}\right)$ (2) $\left(-\frac{7}{5}, \frac{9}{5}\right)$ (3) $\left(\frac{7}{5}, -\frac{9}{5}\right)$ (4) $\left(-\frac{7}{5}, -\frac{9}{5}\right)$

129. The area (in square units) of the triangle formed by the lines $x = 0$, $y = 0$ and $3x + 4y = 12$ is: **(2005)**
(1) 3 (2) 4 (3) 6 (4) 12

130. The equation of the straight line perpendicular to $5x - 2y = 7$ and passing through the point of intersection of the lines $2x + 3y = 1$ and $3x + 4y = 6$ is: **(2005)**
(1) $2x + 5y + 17 = 0$ (2) $2x + 5y - 17 = 0$ (3) $2x - 5y + 17 = 0$ (4) $2x - 5y = 17$

131. If PM is the perpendicular from $P(2, 3)$ onto the line $x + y = 3$, then the coordinates of M are: **(2005)**
(1) (2, 1) (2) (–1, 4) (3) (1, 2) (4) (4, –1)

132. The lines $x - y - 2 = 0$, $x + y - 4 = 0$ and $x + 3y = 6$ meets in the common point: **(2006)**
(1) (1, 2) (2) (2, 2) (3) (3, 1) (4) (1, 1)

133. If A(2,-1) and B(6,5) are two points the ratio in which the foot of the perpendicular from (4,1) to *AB* divides it is **[2007]**
1)8:15 2) 5:8 3) -5:8 4)-8:5

134. The angle between the line joining the points (1,-2)(3,2) and the line x =2y –7 =0 is [2007]
1)π 2)π/2 3)π/3 4)π/6

135. The angle made by the line joining (5,2),(6,-15) at (0,0) is **[2007]**
1)π/6 2)π/4 3)π/2 4)π

136. The value of k such that the lines 2x-3y+k=0.3x-4y-13=0 and 8x-11y-33=0 are concurrent is [2008]
1)20 2)-7 3)7 4)-20

137. The equation of the straight line perpendicular to the straight line 3x+2y=0 and passing through the point of intersection of the lines x+3y–1=0 and x–2y+4=0 is: [2009]
1) 2x–3y+1=0 2) 2x–3y+3=0 3) 2x–3y+5=0 4) 2x–3y+7=0

138. The area (in square units) of the circle which touches the lines 4x+3y=15 and 4x+3y=5 is [2009]
1) 4π 2) 3π 3) 2π 4) π

139. If a straight line L is perpendicular to the line 4x – 2y = 1 and forms a triangle of area 4 square units with the coordinate axes, then an equation of the line L is : [2010]
1) 2x + 4y +7 = 0 2) 2x – 4y + 8 = 0
3) 2x + 4y +8 = 0 4) 4x – 2y – 8 = 0

140. The image of the point (4, -13) with respect to the line 5x + y +6 = 0 is : [2010]
1) (-1, -14) 2) (3, 4) 3) (1, 2) 4) (-4 , 13)

141. The image of the line x + y + z – 2= 0 in the Y – axis is : [2010]
1) x – y + = 0 2) y – x + 2 = 0
3) x + y + 2 = 0 4) x + y – 2 = 0

142. A straight line which makes equal intercepts on positive X and Y axes and which is at a distance 1 unit from the origin intercepts the straight line $y = 2x + 3 + \sqrt{2}$ at (x_0, y_0). Then $2x_0 + y_0 =$ [2010]
1) $3+\sqrt{2}$ 2) $\sqrt{2}-1$ 3) 1 4) 0

143. The number of points P(x, y) with natural numbers as coordinates that lie inside the quadrilateral formed by the lines 2x + y = 2, x = 0, y = 0 and x + y = 5 is [2011]
1) 12 2) 10 3) 6 4) 4

144. The image of the points (3, 8) in the line x + 3y = 7 is [2011]
1) (1, 4) 2) (4, 1) 3) (-1, -4) 4) (-4, -1)

145. The line joining the points A(2, 0) and B(3, 1) is rotated through an angle of 45^0, about A in the anticlockwise direction. The coordinates of B in the new position [2011]
1) $\left(2,\sqrt{2}\right)$ 2) $\left(\sqrt{2},2\right)$ 3) $\left(2,2\right)$ 4) $\left(-4,-1\right)$

146. If a, b, c form a geometric progression with common ratio r, then the sum of the ordinates of the points of intersection of the line ax + by + c = 0 and the curve $x + 2y^2 = 0$ is [2012]
1) $\frac{r^2}{2}$ 2) $-\frac{r}{2}$ 3) $\frac{r}{2}$ 4) r

147. The equation of a straight line passing through the point (1, 2) & inclined at 45^0 to the line y = 2x + 1 is [2012]
1) 5x + y = 7 2) 3x + y = 5 3) x + y = 3 4) x – y + 1 = 0

148. A point moves in the xy-plane such that the sum of its distances from two mutually perpendicular lines is always equal to 5 units. The area (in square units) enclosed by the locus of the point is [2012]
1) $\frac{25}{4}$ 2) 25 3) 50 4) 100

149. If p & q are the perpendicular distances from the origin to the straight lines $x\sec\theta - y\operatorname{cosec}\theta = a$ & $x\cos\theta + y\sin\theta = a\cos 2\theta$ [2013]
1) $4p^2 + q^2 = a^2$ 2) $p^2 + q^2 = a^2$
3) $p^2 + 2q^2 = a^2$ 4) $4p^2 + q^2 = 2a^2$

150. If 2x + 3y = 5 is the perpendicular bisector of the line segment joining the points $A\left(1,\frac{1}{3}\right)$ & B, then B = [2013]
1) $\left(\frac{21}{13},\frac{49}{39}\right)$ 2) $\left(\frac{17}{13},\frac{31}{39}\right)$ 3) $\left(\frac{7}{13},\frac{49}{39}\right)$ 4) $\left(\frac{21}{13},\frac{31}{39}\right)$

151. If the points (1, 2) & (3, 4) lie on the same side of the straight line 3x – 5y + a = 0 then a lies in the set [2013]
1) [7, 11] 2) R – [7, 11] 3) [7, ∞) 4) (–∞,11]

152. If the image of $\left(-\frac{7}{5},-\frac{6}{5}\right)$ in a line is (1, 2), then the equation of the line is (2014)
1) 3x – y = 0 2) 4x – y = 0 3) 3x + 4y = 1 4) 4x + 3y = 1

153. . If a line l passes through (k, 2k), (3k, 3k) & (3, 1), $k \neq 0$ then the distance from the origin to the line l is (2014)

1) $\frac{4}{\sqrt{5}}$ 2) $\frac{3}{\sqrt{5}}$ 3) $\frac{2}{\sqrt{5}}$ 4) $\frac{1}{\sqrt{5}}$

154. Out of thirty points in a plane, eight of them are collinear. The number of straight lines that can be formed by joining these points is (2014)

1) 540 2) 408 3) 348 4) 296

155. The combined equation of the straight line passing through the point (4, 5) & each line making intercepts on the coordinate axes whose sum is -1 is (2015)

1) (3x – 2y – 6)(x – 2y + 2) = 0 2) (3x – 2y + 6)(x – 2y + 2) = 0
3) (3x – 2y – 6)(x – 2y – 2) = 0 4) (3x – 2y + 6)(x – 2y – 2) = 0

156. The value of k>0 such that the angle between the lines 4x – 7 + 7 = 0 & kx – 5y – 9 = 0 (2015)

1) $\frac{25}{3}$ 2) $\frac{5}{3}$ 3) 3 4) 5

157. An equation of a line whose segment between the coordinate axes is divided by the point $\left(\frac{1}{2},\frac{1}{3}\right)$ in the ratio 2 : 3 is (2015)

1) 6x + 9y = 5 2) 9x + 6y = 5 3) 4x + 9y = 5 4) 9x + 4y = 5

158. If the straight lines 2x + 3y – 1 = 0, x + 2y – 1 = 0 & ax + by – 1 = 0 form a triangle with origin as ortho centre, then (a, b) = (2015 A.P)

1) (6, 4) 2) (-3, 3) 3) (-8, 8) 4) (0, 7)

159. The point on the line 4x – y – 2 = 0 which is equidistant from the points (-5, 6) & (3, 2) is (2015 A.P.)

1) (2, 6) 2) (4, 14) 3) (1, 2) 4) (3, 10)

160. If the lines x + 2ay + a = 0, x + 4cy + c = 0 are concurrent, then a, b, c are in (2015 A.P.)

1) Arithmetic progression 2) Geometric progression
3) Harmonic progression 4) Arithmetic – Geometric progression

161. The combined equation of the straight lines of the form y = kx + 1 (where k is an integer) such that the point of intersection of each with the line 3x + 4y = 9 has an integer as its **x**– coordinate is (2016)

1) (y + x + 1)(y + 2x – 1) = 0 2) (y + x - 1)(y + 2x + 1) = 0
3) (y + x + 1)(y + 2x + 1) = 0 4) (y + x - 1)(y + 2x – 1) = 0

162. A value of k such that the straight lines y – 3kx + 4 = 0 & (2k – 1)x – (8k – 1)y – 6 = 0 are perpendicular is (2016)

1) 1/6 2) -1/6 3) 1 4) 0

163. The length of the segment of the straight line passing through (3, 3) & (7, 6) cut off by the coordinate axes is (2016)
1) 4/5 2) 5/4 3) 7/4 4) 4/7

164. If the lines x + 3y – 9 = 0, 4x + by – 2 = 0, & 2x – y – 4 = 0 are concurrent, then the equation of the line passing through the point (b, 0) & concurrent with the given lines is
1) 2x + y + 10 = 0 2) 4x – 7y + 20 = 0
3) x – y + 5 = 0 4) x – 4y + 5 = 0

165. The midpoint of the line segment joining the centroid & the orthocenter of the triangle whose vertices are (a, b), (a, c) & (d, c) is
1) $\left(\frac{5a+d}{6}, \frac{b+5c}{6}\right)$ 2) $\left(\frac{a+5d}{6}, \frac{5b+c}{6}\right)$ 3) (a, c) 4) (a, 0)

166. The distance from the origin to the image of (1, 1) with respect to the line x + y + 5 = 0 is
1) $7\sqrt{2}$ 2) $3\sqrt{2}$ 3) $6\sqrt{2}$ 4) $4\sqrt{2}$

167. The equation of the straight line passing through the point of intersection of 5x–6y–1=0, 3x+2y+5=0 & perpendicular to the line 3x – 5y + 11 = 0 is (2017)
1) 5x + 3y + 18 = 0 2) – 5x – 3y + 18 = 0 3) 5x + 3y + 8 = 0 4) 5x + 3y – 8 = 0

168. If a straight line passing through the points P(3, 4) makes an angle $\pi/6$ with the x – axis & meets the line 12x + 5y + 10 = 0 at Q, then the length of PQ is (2017AP)
1) $\frac{132}{12\sqrt{3}+5}$ 2) $\frac{166}{8\sqrt{3}+6}$ 3) $\frac{182}{6\sqrt{3}+4}$ 4) $\frac{192}{14\sqrt{3}+6}$

169. A(3, -4) is a vertex of ΔABC & 3x + 4y – 18 = 0 is the perpendicular bisector of the side AB. If C = (6, 3) then the centroid of the triangle is (2017AP)
1) (6, 1) 2) (-6, 1) 3) (-6, -1) 4) (6, -1)

170. If p & q are the lengths of the perpendiculars from the origin to the straight lines $x\sec\alpha + y\cos ec\alpha = 10$ & $\alpha - y\sin\alpha = 10\cos 2\alpha$, then $4p^2 + q^2 =$ (2017AP)
1) 10 2) 20 3) 40 4) 100

171. If x_1, x_2, x_3 as well as y_1, y_2, y_3 are in geometric progression with the same common ratio, then the points (x_1, y_1), (x_2, y_2) (x_3, y_3) (2016AP)
1) Vertices of an equilateral triangle 2) Vertices of a right angled triangle
3) Vertices of a right angled isosceles triangle 4) Collinear

172. A straight line makes an intercept on the Y – axis twice as long as that on X – axis & is at a unit distance from the origin. Then the lines is represented by the equations

1) $2x+3y=\pm\sqrt{5}$ 2) $x+y=\pm 2$

3) $x-y=\pm 2$ 4) $2x+y=\pm\sqrt{5}$

173. If the perpendicular distance between the point (1, 1) to the line 3x + 4y + c = 0 is 7, then the possible values of c are (2017)

1) -35, 42 2) 35, 28 3) 42, 28 4) 28, -42

174. If P is the set of all real numbers α such that the product of the lengths of perpendiculars from (α, 1) to the pair of straight lines $3x^2 + 7xy + 2y^2 = 0$ is $\sqrt{2}/5$ then the sum of the elements in P is (2017AP)

1) $-\frac{11}{13}$ 2) $-\frac{14}{3}$ 3) $\frac{11}{3}$ 4) $\frac{14}{3}$

175. If two of the lines represented by $2x^3 + x^2y + y^3 = 0$ are mutually perpendicular, then the slope of the third line is (2017AP)

1) 2 2) 1 3) 0 4) $\frac{1}{2}$

176. The orthocenter of the triangle formed by the lines $2x^2 - 3xy + y^2 = 0$, x + y = 1 is (2017AP)

1) $\left(\frac{1}{4},\frac{1}{4}\right)$ 2) $\left(\frac{1}{3},\frac{1}{3}\right)$ 3) $\left(\frac{1}{2},\frac{1}{2}\right)$ 4) $(1,1)$

KEY

1) **2**	2) **4**	3) **1**	4) **4**	5) **1**	6) **1**	7) **3**	8) **3**	9) **4**	10) **2**
11) **2**	12) **1**	13) **3**	14) **1**	15) **3**	16) **3**	17) **1**	18) **1**	19) **4**	20) **3**
21) **2**	22) **2**	23) **1**	24) **4**	25) **4**	26) **2**	27) **2**	28) **1**	29) **1**	30) **2**
31) **3**	32) **3**	33) **4**	34) **2**	35) **3**	36) **4**	37) **2**	38) **1**	39) **4**	40) **2**
41) **1**	42) **4**	43) **1**	44) **2**	45) **4**	46) **4**	47) **4**	48) **4**	49) **3**	50) **2**
51) **4**	52) **3**	53) **3**	54) **3**	55) **3**	56) **3**	57) **3**	58) **2**	59) **2**	60) **1**
61) **1**	62) **2**	63) **1**	64) **3**	65) **1**	66) **2**	67) **2**	68) **1**	69) **1**	70) **2**
71) **1**	72) **4**	73) **1**	74) **1**	75) **3**	76) **1**	77) **1**	78) **1**	79) **3**	80) **2**
81) **4**	82) **1**	83) **1**	84) **2**	85) **2**	86) **3**	87) **3**	88) **4**	89) **1**	90) **3**
91) **1**	92) **2**	93) **4**	94) **3**	95) **2**	96) **1**	97) **3**	98) **3**	99) **3**	100) **1**
101) **1**	102) **2**	103) **1**	104) **2**	105) **3**	106) **1**	107) **2**	108) **3**	109) **3**	110) **1**
111) **2**	112) **2**	113) **1**	114) **3**	115) **4**	116) **3**	117) **4**	118) **3**	119) **2**	120) **1**
121) **4**	122) **1**	123) **4**	124) **3**	125) **3**	126) **3**	127) **4**	128) **1**	129) **3**	130) **1**
131) **3**	132) **3**	133) 2	134) 2	135) 3	136) **2**	137) **4**	138) **4**	139) **3**	140) **1**
141) **1**	142) **2**	143) 3	144) 3	145) 1	146) 3	147) **2**	148) **3**	149) **1**	150) **2**
151) **2**	152) **3**	153) 4	154) 2	155) 1	156) 3	157) **3**	158) **3**	159) **2**	160) **3**
161) **4**	162) **1**	163) 2	164) 4	165) 1	166) 3	167) **3**	168) **1**	169) **1**	170) **4**
171) **4**	172) **4**	173) 3	174) 2	175) 2	176) 3	177)	178)	179)	180)

EXERCISE-B

1) The line x/a-y/b=1 meets X-axis at P. The equation of the perpendicular To this line at P is
1) x/a+y/b=a/b 2) x/a+y/b=b/a 3) x/b+y/a=a/b 4) x/b+y/a=b/a

2) The line 3x+4y=24 cuts the axes at A and B. the in centre of Δ OAB is
1) (1, 2) 2) (2, 2) 3) (12, 12) 4) (2, 12)

3) The in centre of the triangle formed by the lines x=0 ; y=0; x/3+y/4=1 is
1) (-1,-1) 2) (1, 1) 3) (1, 2) 4) none

4) The foot of the perpendicular from the point (3,4) on the line 3x-4y+5=0 is
1) (81/25, 92/25) 2)(92/25, 81/25) 3)(46/25, 54/25) 4)(-81/25, 92/25)

5) If x+2y+3=0 , x+2y-7=0 and 2x-y-4=0 form the sides of square, the equation of the fourth side is
1)2x-y-6=0 2) 2x+y+6=0 3) 2x-y-14=0 4) 2x-y+14=0

6) The length of the largest altitude of the Δle formed by the straight lines 7x-2y+10 = 0, 7x+2y-10 = 0 and y+2 = 0
1)7 2) 9 3) 6 4) 2

7) Equation of the diagonal passing through the origin of the parallelogram given by the lines 2x+3y=0 ,2x+3y=5, 3x-4y=0, 3x-4y=3 is
1)9x+29y=0 2)9x+28y=0 3)8x+29y=0 4)9x-29y=0

8) If 7x-y+3=0 , x+y-3=0 are two equal sides of an isosceles triangle and the third side passes through (1,0) then the equation of the third side is
1) x-3y-1=0 2)3x+y+1=0 3)x-3y+1=0 4)3x+y-1=0

9) If a,b,c are in A.P then the st. lines ax+by+c=0
1) Pass through a fixed point 2) form an equilateral triangle
3) Form a rhombus 4) form a square

10) The point on the line 2x-3y=5 equidistant from (1,2) ,(3,4)is
1)(2,3) 2)(4,1) 3)(1,1) 4)(4,6)

11) The equation to the st.line through the intersection of x/a+y/b=1 and x/b+y/a=1 and (1,2) is x/a+y/b-1+λ(x/b+y/b-1)=0 where λ=
1) $\frac{2a+b-ab}{2b+a-ab}$ 2) $(y-2)=\frac{ab-2a}{ab-a-b}(x-1)$
3) $\frac{a+b-ab}{a+b+ab}$ 4) $\frac{2a-b+ab}{2b+a-ab}$

12) If A(-1,1), B(5,3) are the opposite vertices of a square in the xy-plane, the equation of the other diagonal (not passing through A,B) of the square is given by
1) x-3y+4=0 2)2x-y+3=0 3)3x+y-8=0 4) x+2y-1=0

13) ABCD is a parallelogram. Equation of AB and AD are 4x+5y=0 and 7x+2y=0, and the equation of the diagonal BD is 11x+7y=9 then the equation of AC is
1)x+y+1=0 2) x+y-1=0 3) x+y=0 4) x-y=0

14) The reflection of the point (4,-13) in the line 5x+y+6=0 is
1) (-1,-14) 2)(3,4) 3)(1,2) 4)(-4,13)

15) A point equidistant from the lines 4x+3y+10=0 , 5x-12y+26=0 and 7x+24y-50=0 is
1)(1,-1) 2)(1,1) 3)(0,0) 4)(0,1)

16) The lines 2x+y-1=0, ax+3y-3=0 and 3x+2y-2=0 are concurrent
1) For all a 2) for a=4 only 3) for $-1 \le a \le 3$ 4) for a>0 only

17) The diagonals of the parallelogram whose sides are lx+my+n=0, lx+my+n'=0, mx+ly+n=0,mx+ly+n'=0 include an angle
1)π/3 2)π/2 3) $\tan^{-1}\left(\frac{l^2-m^2}{l^2+m^2}\right)$ 4) $\tan^{-1}\left(\frac{2lm}{l^2+m^2}\right)$

KEY

1) **3**	2) **2**	3) **2**	4) **1**	5) **3**	6) **1**	7) **4**	8) **1**	9) **1**	10) **2**
11) **2**	12) **3**	13) **4**	14) **1**	15) **3**	16) **1**	17) **2**			

AIEEE PROBLEMS

1. A square of a side *a* lies above the x-axis and has one vertex at the origin. The side passing through the origin makes an angle $\alpha\left(0<\alpha<\frac{\pi}{4}\right)$ with the positive direction of x – axis. The equation of its diagonal not passing through the origin is [2003]
1) $y(\cos\alpha-\sin\alpha)-x(\sin\alpha-\cos\alpha)=a$ 2) $y(\cos\alpha+\sin\alpha)+x(\sin\alpha-\cos\alpha)=a$
3) $y(\cos\alpha+\sin\alpha)+x(\sin\alpha+\cos\alpha)=a$ 4) $y(\cos\alpha+\sin\alpha)+x(\sin\alpha-\cos\alpha)=a$

2. The equation of the straight lines passing through the point (4, 3) and taking intercepts on the co – ordinates axes whose sum id -1 is [2004]
1) $\frac{x}{2}+\frac{y}{3}=-1$ *and* $\frac{x}{-2}+\frac{y}{1}=-1$

2) $\frac{x}{2}-\frac{y}{3}=1$ *and* $\frac{x}{-2}+\frac{y}{1}=1$

3) $\frac{x}{2}+\frac{y}{3}=1$ *and* $\frac{x}{2}+\frac{y}{1}=1$

4) 4) $\frac{x}{2}-\frac{y}{3}=-1$ *and* $\frac{x}{-2}+\frac{y}{1}=-1$

3. Let A (2, -3) and B (-2, 1) be vertices of a triangle ABC. If the centroid of this triangle moves on the line 22 + 3y = 1, then the locus of the vertex C is the line [2004]

1. 2x + 3y = 9 2) 3x – 2y = 3
3) 3x + 2y = 5 4) 2x -3y = 7

4. A straight line through points A(3, 4) is such that its intercept between the axes is bisected at A. Its equation is [2006]

1) 4x + 3y = 24 2) 3x + 4y = 25 3) x + y = 7 4) 3x – 4y + 7 = 0

5. Let P = (-1, 0), Q = (0, 0) and $R=(3,3\sqrt{3})$ be three points. The equation of the bisector of the angle PQR is [2007]

1) $\sqrt{3}x+y=0$ 2) $x+\frac{\sqrt{3}}{2}y=0$

3) $\frac{\sqrt{3}}{2}x+y=0$ 4) $x+\sqrt{3}y=0$

KEY

1) 4	2) 2	3) 1	4) 1	5) 1

20. PAIR OF STRAIGHT LINES
SYNOPSIS

1. The equation of the pair of angular bisectors between the lines $ax^2 + 2hxy + by^2 = 0$ is $h(x^2 - y^2) - xy(a - b) = 0$.

2. The angular bisectors are always mutually perpendicular.

3. If the equation of the pair of lines $ax^2 + 2hxy + by^2 = 0$ passing through (x_1, y_1) and parallel to the given pair is $a(x - x_1)^2 + 2h(x - x_1)(y - y_1) + b(y - y_1)^2 = 0$.

4. If the equation for the pair of lines $ax^2 + 2hxy + by^2 = 0$ passing through (x_1, y_1) and perpendicular to the given pair of lines is $b(x - x_1)^2 + 2h(x - x_1)(y - y_1) + b(y - y_1)^2 = 0$

5. If a general second degree equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ in x and y represents a pair of lines then $abc + 2fgh - af^2 - bg^2 - ch^2 = 0$ or $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix} = 0$.

   Here (i) $h^2 \geq ab$, (ii) $g^2 \geq ac$ (iii) $f^2 \geq bc$

6. The general second degree equations $ax^2 + 2hxy + by^2 + 2gx + 2fy = 0$ represents a pair of parallel lines if and only if $h^2 = ab$ and $af^2 = bg^2$.

7. The distance between two parallel lines is $\sqrt{\dfrac{g^2 - ac}{a(a+b)}}$ or $\sqrt{\dfrac{f^2 - bc}{b(a+b)}}$.

8. If the pair of lines intersecting then their point of intersection is $\left(\dfrac{hf - bg}{ab - h^2}, \dfrac{gh - af}{ab - h^2}\right)$.

9. The product of lengths of perpendicular from (α, β) upon the lines $ax^2 + 2hxy + by^2 = 0$ is $\left|\dfrac{a\alpha^2 + 2h\alpha\beta + b\beta^2}{\sqrt{(a-b)^2 + 4h^2}}\right|$.

10. The products of lengths of perpendicular from (α, β) upon the line $ax^2 + 2hxy + by^2 + 2gx + 2gy + c = 0$ is $\left|\dfrac{a\alpha^2 + 2h\alpha\beta + b\beta^2 + 2g\alpha + 2f\beta + c}{(a-b)^2 + 4h^2}\right|$.

11. The product of lengths of perpendicular from the origin upon the lines

$ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ is $\left|\dfrac{c}{\sqrt{(a-b)^2 + 4h^2}}\right|$.

13. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a pair of straight lines than the distance of the point of intersection from the origin is $\dfrac{\sqrt{c(a+b) - f^2 - g^2}}{ab - h^2}$

14. Equation of pair of straight lines passing through origin is $ax^2+2hxy+by^2=0$.

15. If a+b=0, then the lines are perpendicular.

16. If $h^2 = ab$, then the lines are coincident.

17. The equation of pair of co-ordinates axes is xy=0.

18. The equation of pair of angular bisectors of the co-ordinate axes is $x^2-y^2=0$.

19. If θ is the angle between the pair of straight lines $ax^2+2hxy+by^2=0$

    a) $\sin\theta = 2\sqrt{(h^2-ab)/[(a-b)^2 + 4h^2]}$

    b) $\cos\theta = (a+b)/\sqrt{[(a-b)^2 + 4h^2]}$

    c) $\tan\theta = 2\sqrt{(h^2-ab)}/(a+b)$

20. The area of Δ formed by the lines lx+my +n=0 and $ax^2 + 2hyx + by^2=0$

    $$\left|\frac{n^2\sqrt{(h^2-ab)}}{am^2 - 2hlm + bl^2}\right|$$

21. The lines lx+my+n=0 and $(lx+my)^2-3(mx-ly)^2=0$ is always forms an equilateral Δ whose area is $n^2/\sqrt{3}\,(l^2+m^2)$ sq units.

22. The equation to the pair of lines passing through the origin and forming an equilateral triangle with line ax +by+c = 0 is $(ax+by)^2-3(bx-ay)^2=0$.

23. One of the lines of $ax^2+2hxy+by^2=0$ is parallel to lx+my+n=0, then $bl^2-2hlm+am^2=0$.

24. One of the lines of S=0 is perpendicular to lx+my+n=0, then $al^2+2hlm+bm^2=0$.

25. The equation of angular bisector of the pair of straight lines $ax^2+2hyx+by^2=0$ is $h(x^2-y^2)-xy(a-b)=0$ and the angular bisectors are always $\perp$ to each other.

26. The pair of straight line $h(x^2-y^2)-xy(a-b)=0$ and $(a-b)(x^2-y^2)+4hxy=0$ are the angular bisector of each other.

27. If two pair of straight lines have their same angular bisectors then are said to be equally inclined to each other .

28. The pair straight lines $ax^2+2hxy+by^2=0$ and $a^2x^2+2h(a+b)xy+b^2y^2$ are equally inclined each other.

29. The sum of slopes of the pair of straight lines represented by $ax^2+2hxy+by^2=0$ is $-2h/b$ and the product of the slopes is a/b.

30. If $ax^2+2hxy+by^2=0$ represent two sides of a parallelogram having one diagonal $px+qy=1$ then the other diagonal is $y(bp-hq)=x(aq-hp)$.

31. The equation of the pair of straight lines passing through origin and at a distance 'd' from (x_1,y_1) is $(xy_1-yx_1)^2=d^2(x^2+y^2)$.

32. The distance of the point of intersection of the pair of straight line S=0 from origin is

$$\sqrt{[c(a+b)-f^2-g^2]/(ab-h^2)}$$

33. The pair of straight line $ax^2+2hxy+by^2=0$ and the lines $ax^2+2hxy+by^2+2gx+2fy+c=0$ forms a rhombus if $(a-b)fg+h(f^2-g^2)=0$ other wise it is a parallelogram.

36. The pair of straight lines $ax^2+2hxy-ay^2=0$
$ax^2+2hxy-ay^2+2gx+2fy+c=0$ forms a square, if $2afg+h(f^2-g^2)=0$ other wise the figure is a rectangle.
$S=ax^2+2hxy+by^2+2gx+2fy+c=0$.

37. The condition for the equation S=0 to represent a pair of straight lines equidistance from origin is $f^4-g^4=c(bf^2-ag^2)$

38. The condition for the pair of straight line $ax^2+2hxy+by^2+2gx+2fy+c=0$ is intersect on x-axis is $g^2=ac$ or a, g, c are in G.P.

39. The angle between the lines joining origin to the points of intersection of the curve $ax^2+2hxy-ay^2+gx+fy=0$ and straight line $fx-gy+k=0$ is always 90^0

40. The condition for the lines joining origin to the points of intersection of the line $y=mx+c$ and the $x^2+y^2=a^2$ to be perpendicular is $2c^2=a^2(1+m^2)$

41. Equation of the pair of lines whose angular bisectors are $lx+my=0$ and $mx-ly=0$ will be in the form $(lx+my)^2-k(mx-ly)^2=0$.

42. Area of the triangle formed by the x-axis and the angular bisector of pair $ax^2+2hxy+by^2+2gx+2fy+c=0$ is

$$\left|\frac{\sqrt{[(a-b)^2+4h^2]}}{2h}.\frac{(g^2-ac)}{(ab-h^2)}\right|$$

43. Area of the triangle formed by y-axis and the angular bisectors of the pair $ax^2+2hxy+by^2+2gx+2fy+c=0$ is

$$\left|\frac{\sqrt{[(a-b)^2+4h^2]}}{2h}.\frac{(f^2-bc)}{(ab-h^2)}\right|$$

44. Equation of pair of angular bisectors of the lines represented by $ax^2+2hxy+by^2+2gx+2fy+c=0$ is $\frac{(x-x_1)^2-(y-y_1)^2}{(a-b)}=\frac{(x-x_1)(y-y_1)}{h}$
where (x_1,y_1) is the point of intersection of the pair of lines.

45. Equation of the diagonal of the parallelogram not passing through the origin is $2gx+2fy+c=0$.

46. Equation of the diagonal of the parallelogram passing through the origin is $(hf-bg)y=(gh-af)x$.

47. If 'θ' is the angle between the lines joining the origin to the points of intersection of the circle $x^2+y^2=a^2$ and the line $lx+my+n=0$, then

$\cos\theta/2 = \left|n/[a\sqrt{[l^2+m^2]}\right|$

If these lines are perpendicular then $a^2(l^2+m^2)=2n^2$.

48. If pair of lines $x^2-2pxy-y^2=0$ and $x^2-2qxy-y^2=0$ be such that each pair bisects the angle between the other pair then $pq=-1$.

49. Equation to the pair of lines intersecting at origin and at a distance'd' from a fixed point (x_1,y_1) is $(xy_1-yx_1)^2=d^2(x^2+y^2)$.

50. The lines joining origin to the points of intersection of the curves $a_1x^2+2h_1xy+b_1y^2+2g_1x=0$ and $a_2x^2+2h_2xy+b_2y^2+2g_2x=0$ will be at right angles iff $(a_1+b_1)/(a_2+b_2)=g_1/g_2$.

51. The pair of lines $ax^2+2hxy+by^2=0$ and the lines $ax^2+2hxy+by^2+2gx+2fy+c=0$ form
(a) a rhombus if $(a-b)fg+h(f^2-g^2)=0, a+b \neq 0$
(b) a square if $(a-b)fg+h(f^2-g^2)=0, a+b = 0$.
(c)a rectangle if $(a-b)fg+h(f^2-g^2) \neq 0, a+b=0$.
(d)a parallelogram if $(a-b)fg+h(f^2-g^2) \neq 0, a+b\neq 0$

52. The equation to the pair of lines joining the origin to the points of intersection of the line lx+my=n and a curve $Ax^2+2Hxy+By^2+2Gx+2Fy+C=0$ is given by $Ax^2+2Hxy+By^2+(2Gx+2Fy)[(lx+my)/n]+C[(lx+my)/n]^2=0$.

53. The area of the triangle formed by the line $lx+my+n=0$ and the pair of lines $ax^2+2hxy+by^2+2gx+2fy+c=0$ whose point of intersection is (x_1, y_1) is $\frac{(lx_1+my_1+n)^2\sqrt{h^2-ab}}{|bl^2-2hlm+am^2|}$ sq. units.

Exercise-A

1. If the pair of lines $x^2+16xy-11y^2=0$ form an equilateral triangle with the line $2x+y+1=0$ then its area is
(1) $\frac{1}{5\sqrt{2}}$ sq. units (2) $\frac{1}{3\sqrt{3}}$ sq. units (3) $\frac{1}{2\sqrt{2}}$ sq. units (4) $\frac{1}{5\sqrt{5}}$ sq. units

2. The value of k for which the equation $12x^2-10xy+2y^2+14x-5y+k=0$ represents a pair of lines
(1) 2 (2) 3 (3) 4 (4) 1

3. If the lines joining the origin to the points of intersection of the line $x+2y=k$ with the curve $2x^2-2xy+3y^2+2x-y-1=0$ are at right angle then $k=$
(1) ± 2 (2) ± 1 (3) ± 3 (4) $\pm\sqrt{2}$

4. The condition for the lines joining the origin to the points of intersection of the circle $x^2+y^2=a^2$ with the line $y=mx+c$ to be perpendicular is
(1) $2c^2=a^2(1+m^2)$ (2) $c^2=a^2(1+m^2)$
(3) $2c^2=a^2(1-m^2)$ (4) $c^2=a^2(1-m^2)$

5. The area of the triangle formed by the straight lines $x^2+4xy+y^2=0$ and $x+y=1$ is
(1) $\frac{3}{2}$ sq. units (2) $\frac{5}{2}$ sq. units (3) $\frac{\sqrt{3}}{2}$ sq. units (4) $\frac{\sqrt{5}}{2}$ sq. units

6. The angle between the lines represented by $x^2-y^2+x-y=0$ is
(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{3}$ (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{6}$

7. The distance between the parallel lines is given by $x^2+2\sqrt{2}xy+2y^2+4x-8=0$ is
(2) 4 (1) $2\sqrt{2}$ (3) $4\sqrt{2}$ (4) 8

8. The area of the triangle formed by the lines $x^2 + 4xy + y^2 = 0$, $x + y + 1 = 0$ is

(1) $\sqrt{3}$ (2) 2 (3) 1 (4) $\frac{\sqrt{3}}{2}$

9. The distance between the parallel lines $9x^2 - 6xy + y^2 + 18x - 6y + 8 = 0$ is

(1) $\frac{1}{\sqrt{10}}$ (2) $\frac{2}{\sqrt{10}}$ (3) $\frac{4}{\sqrt{10}}$ (4) $\sqrt{10}$

10. If $ax^2 + 6xy + by^2 - 10x + 10y - 6 = 0$ represents a pair of perpendicular lines then $|a| =$

(1) 2 (2) 4 (3) 1 (4) 3

11. The point of intersection of the pair of lines
$x^2 + xy - 2y^2 - 5x + 2y + 4 = 0$ is

(1) (1, 2) (2) (2, 1) (3) (1, 1) (4) (2, 2)

12. If the pair of lines given by $(x^2 + y^2)\sin\alpha = (x\cos\alpha - y\sin\alpha)^2$ are perpendicular to each other then $\alpha =$

(1) $\frac{\pi}{2}$ (2) 0 (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{3}$

13. The difference of slopes of the lines represented by $y^2 - 2xy\sec^2\alpha + (3 + \tan^2\alpha)(-1 + \tan^2\alpha)x^2 = 0$ is

(1) 2 (2) 4 (3) 6 (4) 8

14. The product of perpendiculars from $(-1, 2)$ to the pair of lines $2x^2 - 5xy + 2y^2 = 0$ is

(1) 4 (2) 3 (3) 8 (4) 5 / 2

15. The angle between the pair of lines $y^2\cos^2\theta - xy\cos^2\theta + x^2(\sin^2\theta - 1) = 0$ is

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{3}$ (3) $\frac{2\pi}{3}$ (4) $\frac{\pi}{2}$

16. If $\lambda x^2 + 6xy + 9y^2 + 4x + 12y + 3 = 0$ represents two perpendicular straight lines then $\lambda =$

(1) -3 (2) -4 (3) 1 (4) 54

17. If the equation $ax^2 + 5xy - 6y^2 - 10x + 11y + c = 0$ represents two perpendicular lines then $c =$

(1) 6 (2) -6 (3) 4 (4) -4

18. If the pair of lines $3x^2 - 5xy + py^2 = 0$ and $6x^2 - xy + 5y^2 = 0$ have one line in common then $p =$

(1) $\frac{25}{4}$ (2) $\frac{4}{25}$ (3) 2 (4) –2

19. The difference of the slopes of the lines $3x^2 - 8xy - 3y^2 = 0$ is
(1) $\frac{3}{10}$ (2) $\frac{10}{3}$ (3) $\frac{-3}{10}$ (4) $\frac{-10}{3}$

20. The angle between the pair of lines $2x^2-7xy+3y^2=0$
1)π/6 2)π/4 3)π/3 4) $\tan^{-1}(14/15)$

21. The angle between the pair of lines $2x^2+5xy+2y^2=0$ is
1) $\cos^{-1}(4/5)$ 2) $\tan^{-1}(4/5)$ 3)π/4 4)π/2

22. Angle between the pair of lines $x^2+2xy\sec\alpha+y^2=0$ is
1)π/2 2)π/4 **3)**α 4)2α

23. If θ is the acute angle between the pair of lines $x^2+3xy-4y^2=0$, then sinθ=
1)π/6 2) π/3 **3)5/√34** 4)3/√34

24. If the acute angle between the lines $2x^2+5xy+3y^2=0$ is $\tan^{-1}k$, then k=
1)2/5 2)3/5 3)1/5 4)4/5

25. If the pair of lines $a^2(x^2+y^2)=(ax-by)^2$ are perpendicular to each other, then
1) a=b 2)a=-b 3)a=±b 4)none

26. The acute angle between the lines $11x^2-16xy-y^2=0$ is
1)π/6 2)π/4 3)π/3 4)π/2

27. If the slope of one line of the pair $ax^2+2hxy+by^2=0$ is double that of the other, then
1)$8h^2=9ab$ 2)$9h^2=8ab$ 3)$3h^2=4ab$ 4) $h^2=ab$

28. If the slopes of the lines represented by $ax^2+2hxy+by^2=0$ are in the ratio 3:2, then
1)$25ab=24h^2$ 2)$8h^2=9ab$ 3)$16h^2=25ab$ 4)$25h^2=16ab$

29. The difference of the slopes o the lines $3x^2-8xy-3y^2=0$ is
1)3/10 2)-3/10‘ 3)-10/3 4)10/3

30. The difference of the slopes of the lines $4x^2-24xy+11y^2=0$ is
1)20/11 2)24/11 3)4/11 4)44/11

31. The area of the triangle formed by the lies $6x^2-13xy+6y^2=0$ and the line x+y-5=0, (in square units) is
1)25/2 2)5 3)5/2 4)1/5

32. The area of the triangle formed by the lines $x^2-9xy+18y^2=0$ and the line $y-1=0$ is (in sq. units)
1)3/4 2)3/2 3)6 4)3

32. The area of the equilateral triangle formed by the line $x^2-4xy+y^2=0$ and the line $x+y-3=0$, in sq. units is
1)$\sqrt{3}/2$ 2)$3\sqrt{3}/2$ 3)$5\sqrt{3}/2$ 4)$3\sqrt{2}/2$

33. The area of the equilateral triangle formed by the lines passing through the origin and the line $12x-5y+13=0$ in sq. units is
1)$3\sqrt{3}$ 2)$2\sqrt{3}$ 3)$\sqrt{3}$ 4) $1/\sqrt{3}$

34. If the product of the perpendicular distances from (1,k) to the pair of lines $x^2-4xy+y^2=0$ is 3/2 units, then k=_____
1)4 2)5 3)6 4)8

35. If the product of the perpendicular from (k, k) to the pair of lines $x^2+4xy+3y^2=0$ is $4/\sqrt{5}$ then k is
1) ± 4 2) ± 3 3) ± 2 4) ± 1

36. If the equation of pair of bisectors of the angle between the pair of line $3x^2+xy+by^2=0$ is $x^2-14xy-y^2=0$, then b=_____
1) 4 2)-4 3)8 4)-8

37. If the equation of the pair of angular bisectors of the pair of lines $ax^2-24xy+20y^2=0$ is $12x^2-17xy-12y^2=0$, then a=_____
1)-2 2)2 3)-3 4)3

38. If the pair of lines $x^2+(3+k)xy-6y^2=0$ are equally inclined to the coordinate axes, then k=_____
1)0 2)-3 3)3 4)6

39. The pair of lines $(a-\lambda)x^2+2hxy+(b-\lambda)y^2=0$, $ax^2+2hxy+by^2=0$ are
1) Mutually perpendicular 2) equally inclined to the axes
3) Equally inclined to each other 4) none

40. The equation of the pair of angular bisectors of
$(a-b)\ x^2+4hxy-(a-b)\ y^2=0$ is
1) $hx^2-(a-b)\ xy-hy^2=0$ 2) $ax^2+2hxy-by^2=0$
3) $hx^2+ (a-b)\ xy-hy^2=0$ 4) $ax^2+ (a-b)\ xy-by^2$

41. If the pairs of lines $3x^2-5xy+py^2=0$ and $6x^2-xy-5y^2=0$ have one line in common, then P=_____
1)2, 25/4 2)-2, 25/4 3)-2,-25/4 4)2,-25/4

42. The equation of the line common to the pair of lines $m^2x^2-(m^2+1)xy+y^2=0$ and $mx^2-(m+1)xy+y^2=0$ is
1) $mx-y=0$ 2) $x+y=0$ 3) $x-y=0$ 4) $x+y=m$

43. If the equation $2x^2-2xy-y^2-6x+6y+c=0$ represents an pair of lines, then c=____
1)-1 2)1 2)3 4)2

44. The value of k such that $3x^2-11xy+10y^2-7x+13y+k=0$ may represent a pair of st. lines, then k=_____
1)3 2)4 3)6 4)8

45. If the equation $12x^2+7xy-py^2-18x+qy+6=0$ represents a pair of perpendicular st.lines, then q=
1)12 2)1 3)-12 4)6

46. If the equation $9x^2+24xy+by^2-12x+2fy-12=0$ represents a pair of parallel lines, then f=
1)-4 2)-6 3)-8 4)-12

47. The point of intersection of the perpendicular lines $ax^2+3xy-2y^2-5x+5y+c=0$ is
1) (1/5, 7/5) 2) (1, 7) 3) (-1/5,-7/5) 4) (1/5, 1/5)

48. The point of intersection of th pair of lines $6x^2+xy-12y^2-14x+47y-40=0$ is
1)(2,1) 2)(1,-2) 3)(1,2) 4)(-1,-2)

49. If the acute angle between the pair of lines $x^2-3xy+2y^2+3x-5y+2=0$, then $\sin\theta$=_____
1)$1/\sqrt{3}$ 2)1/3 3)1/10 4)$1/\sqrt{10}$

50. If the acute angle between the pair of lines $\lambda x^2+7xy+3y^2+3x+y-2=0$ is 45^0, then λ=_____
1)3 2)1 3)2 4)4

51. If the angle between the pair of lines $(2x+y+2)(x+2y+2)=0$ is $\pi/4$, then λ=_____
1) ± 6 2) ± 7 3) ± 5 4) ± 1

52. The distance between the two parallel lines $9x^2+6xy+y^2+18x-6y+8=0$
1)$1/\sqrt{10}$ 2)$2/\sqrt{10}$ 3)$4/\sqrt{10}$ 4) $\sqrt{10}$

53. If the distance between the pair of parallel lines $9x^2+2hxy+4y^2+6x+2fy-3=0$ is
1)$1/\sqrt{13}$ 2)$2/\sqrt{13}$ 3)$4/\sqrt{13}$ 4)$5/\sqrt{13}$

54. If the distance between the pair of parallel lines $x^2+2xy+y^2-8ax-8ay+9a^2=0$ is $25\sqrt{2}$, then a =_____
1)1 2)2 3)3 4)5

55. The equation of the pair of lines passing through the origin and parallel to the pair of lines $2x^2+5xy+2y^2+3x+3y+1=0$ is
1)$2x^2+5xy+2y^2=0$ 2)$2x^2-5xy-2y^2=0$ 3)$2x^2+5xy-2y^2=0$ 4)$2x^2-5xy+2y^2=0$

56. The equation of pair of lines passing through (1,-1) and parallel to the pair of lines $x^2-y^2=0$ is
1) $x^2-y^2+2x+2y=0$ 2)$x^2-y^2-2x-2y=0$ 3)$x^2+y^2-2x+2y=0$ 4) $x^2+y^2-2x-2y=0$

57. The equation to the pair of st. lines passing through (1,1) and perpendicular to the pair of lines $3x^2-10xy+3y^2=0$ is
1)$3x^2+10xy+3y^2+16x+16y+16=0$ 2)$3x^2+10xy+3y^2-16x-16y+16=0$
3)$3x^2+10xy-3y^2+16x+16y+16=0$ 4)$3x^2+10xy+3y^2+16x+16y-16=0$

58. The equation to the pair of st.lines passing through (2,1) and perpendicular to the pair of lines $4xy+2x+6y+3=0$ is
1) $xy+x+2y=0$ 2) $xy+x+2y-2=0$ 3) $xy+x-2y=0$ 4)$xy-x-2y+2=0$

59. If c is a constant then $x^2-y^2+cx+cy=0$ represents a pair of
1) Parallel lines 2) perpendicular lines 3) imaginary lines 4) Intersecting lines

60. The equation $ax^2+2\sqrt{(ab)}xy+by^2=0$ where $ab>0$ represents a pair of
1) Parallel lines 2) perpendicular lines
3) coincident lines 4) Imaginary lines

61. The triangle formed by the pair of lines $x^2-4y^2=0$ and $x-a=0$ is always
1) Equilateral 2) isosceles 3) right angled 4) scalene

62. The lines $x^2-4xy+y^2=0$, $x+y=3$ form a triangle which is
1) Equilateral 2) right angled 3) isosceles 4) scalene

63. The figure formed by the pairs of lines $x^2-x-2=0$ and $9x^2-24xy+16y^2+3x-4y-56=0$ is a
1) Parallelogram 2) rhombus 3) rectangle 4) square

64. The figure formed by the pairs of lines $3x^2+10xy+3y^2=0$ and $3x^2+10xy+3y^2-4x+4y-4=0$ is a
1) Parallelogram 2) rhombus 3) rectangle 4) square

65. The figure formed by the pairs of lines $3x^2+10xy+3y^2=0$ and $3x^2+10xy+3y^2-28x-28y+49=0$ is a
1) Parallelogram 2) rhombus 3) rectangle 4) square

66. The length of the intercept cut off by the pair of lines $3x^2+10xy+3y^2-28x-28y+49=0$ on the x-axis is
1)4 2)14/3 3)3 4)8/3

67. The length of the intercept cut off by the pair of lines $2x^2+\lambda xy+3y^2+8x+14y+8=0$ on the y-axis is
1)2 2)8/3 3)3 4)10/3

68. The product of perpendiculars from (f,-g) to the pair of st.line hxy+gx+fy+c=0 is
1)|fg| 2)|(fg-c)/h| 3)|fgh-c| 4)|(fgh-c)/h|

69. The product of the perpendiculars from (1,1) to the pair of lines $2x^2+5xy+2y^2+3x+3y+1=0$ is
1)16/5 2)12/5 3)8/5 4)4/5

70. The centroid of the triangle formed by the lines $12x^2-20xy+7y^2=0, 2x-3y+4=0$ is
1) (8/3, 8/3) 2) (4/3, 4/3) 3) (2/3, 2/3) 4) (1/3, 1/3)

71. The centroid of the triangle formed by the lines $2x^2-5xy+2y^2=0$ and x+y=1 is
1) (2/3,2/3) 2)(1/3,1/3) 3)(-1/3,-1/3) 4)(-2/3,-2/3)

72. If the two sides of a triangle are given by $x^2+xy-2y^2=0$ and the centroid is (-1/3,1/3), then the equation of the third side is
1) X+y+2=0 2) x+y-2=0 3)x-y-2=0 4)x-y+2=0

73. If the two sides of a triangle are given by $x^2-xy-6y^2=0$ and the centroid is (11/3, -1) then the mid point of the third side is
1) (11,-3) 2) (11/2,-3/2) 3) (11/6,-1/2) 4) (11/6,1/2)

74. The orthocenter of the triangle formed by the lines $x^2+xy-2y^2=0$ and x+y+2=0 is
1)(-5,1) 2)(-5/3,1/3) 3)(-1,-1) 4)(-4,2)

75. The orthocenter of the triangle formed by the lines $3x^2-xy-2y^2=0$ and 2x+3y-5=0 is
1) (2/5,-3/5) 2) (-2/5, 3/5) 3) (-2/5,-3/5) 4) (2/5, 3/5)

76. The orthocenter of the triangle formed by the lines $x^2-3y^2=0$ and the line x=a is
1) (a/3, 0) 2)(2a/3,0) 3)(a,0) 4)(4a/3,0)

77. The equation of the bisectors of the angels between the two st.lines $2x^2-3xy+y^2=0$ is

1)$3x^2+2xy-3y^2=0$ 2)$2x^2+3xy-2y^2=0$ 3) $3x^2-2xy-3y^2=0$ 4) $2x^2-3xy-2y^2=0$

78. The quadrilateral formed by the pair of lines $xy+x+y+1=0$, $xy+3x+3y+9=0$ is a

1) Parallelogram 2) rhombus 3) rectangle 4) square

79. The lines $xy+x+y+1=0$ and $x+ay-3=0$ are concurrent if a=

1)-2 2)2 3)-4 4)4

80. A: The length of the intercept on the x-axis cut by the pair of lines $2x^2+5xy+3y^2+6x+7y+1=0$ is $\sqrt{7}$

R : The length of the intercept on the x-axis cut by the pair of lines

$ax^2+2hxy+by^2+2gx+2fy+c=0$ is $2\sqrt{g^2-ac}/|a|$

1)Both A and R are true and R iscorrect explanation of A

2)Both A and R are true and R is not correct explanation of A

3)A is true but R is false 4)A is false but R is true

81. Match the following.

Concurrent lines	Value of k
I. $xy+x+y+1=0, x+ky-3=0$	a)3
II. $xy-x-y+1=0, kx+2y-3=0$	b)1
III. $xy+x+y+1=0, kx+2y+3=0$	c)1/3
IV. $xy+3x-2y-6=0, 3x+ky-5=0$	d)-4

1)c,d,b,a 2)b,a,d,c 3)d,a,b,c 4)a,b,c,d

82. Match the following

I. Centroid of the triangle formed by $12x^2-20xy+7y^2=0$, $2x-3y+4=0$	a)(2,-1)
II. Circumcentre of the triangle formed by $xy=0, x+y=4$	b)(8/3,8/3)
III. Orthocentre of the triangle formed by $x+3y=10$, $6x^2+xy-y^2=0$	c)(2,2)
IV. Point of intersection of $x^2+xy+2y^2-3x+2y+4=0$	d)(3,1)

1)c,d,a,b 2)b,c,d,a 3)a,b,d,c 4)a,b,c,d

83. The equation $ax^2+8xy+2y^2+2gx+13y+c=0$ represents a pair of parallel straight lines.

Match the following

I. a	a)13
II. g	b)7
III. c	c)8
	d)15

1)c,b,d 2)a,b,c 3)c,a,d 4)a,c,d

PREVIOUS EAMCET PROBLEMS

84. If $2x^2-5xy+2y^2=0$ represents two sides of a triangle whose centroid is (1,1) , then the equation of the 3rd side is [EAMCET 1998]
1) x+y=3 2) x+y=1 3)2x+2y=3 4)x+2y=0

85. The equation to the pair of lines through (1,-1) and perpendicular to the pair f lines $x^2-xy-2y^2=0$ is [EAMCET 1998]
1)$2x^2-xy+y^2+5x+y+2=0$ 2)$2x^2-xy-y^2-5x-y+2=0$
3)$x^2-xy+2y^2-5x-y-2=0$ 4)$2x^2-xy-y^2+5x+y-2=0$

86. The angle between the pair of lines $2(x+2)^2+3(x+2)(y-2)-2(y-2)^2=0$
1)$\pi/4$ 2)$\pi/3$ 3)$\pi/6$ 4)$\pi/2$ [EAMCET 1998]

87. If the pair of lines given by $(x^2+y^2)\sin^2\alpha=(x\cos\alpha-y\sin\alpha)^2$ are perpendicular to each other, then α= [EAMCET 1998]
1)$\pi/2$ 2)0 3)$\pi/4$ 4)$\pi/3$

88. The equation of line common to the pair of lines [EAMCET 1998]
$(p^2-q^2)x^2+(q^2-r^2)xy+(r^2-p^2)y^2=0$ and $(l-m)x^2+(m-n)xy+(n-1)y^2=0$
1) x+y=0 2) x-y=0 3)x+y=pqr 4)x-y=pqr

89. The equation of the line common to the pair of lines $(p^2-q^2)x^2+(q^2-r^2)xy+(r^2-p^2)y^2=0$ and $(l-m)x^2+(m-n)xy+(n-l)y^2=0$ is [EAMCET98]
1)x+y=0 2)x-y=0 3)x+y=pqr 4)x-y=pqr

90. The equation to the pair of lines through (1,-1) and perpendicular to the pair of lines $x^2-xy-2y^2=0$ is [EAMCET 98]
1)$2x^2-xy+y^2+5x+y+2=0$ 2)$2x^2-xy-y^2-5x-y+2=0$
3)$x^2-xy+2y^2-5x-y-2=0$ 4)$2x^2-xy-y^2+5x+y-2=0$

91. The product of the perpendiculars from (-1,2) to the pair of lins $2x^2-5xy+2y^2=0$ is
1)4 2)3 3)8 4)5/2 [EAMCET 98]

92. If a,h,b are in A.P then the triangular area formed by the pair of lines $ax^2+2hxy+by^2=0$ and the line x-y=-2 is, in square units [EAMCET 98]
1)|a+b/a-b| 2)|a2+b2/a-b| 3)|a-b/a+b| 4)|a2+b2/a+b|

93. The product of the perpendiculars from (-1,2) to the pair of lines $2x^2-5xy+2y^2=0$ is
1)4 2)3 3)8 4)5/2 [EAMCET 1999]

94. If λ x2+6xy+9y2+4x+12y+3=0 represents a pair of st.lines, then λ=
1)-3 2)-4 3)1 4)5 [EAMCET 1999]

95. The angle between the pair of lines $y^2\cos^2\theta-xy\cos^2\theta+x^2(\sin2\theta-1)=0$ is [EAMCET 1999]

1)$\pi/4$ 2)$\pi/3$ 3)$2\pi/3$ 4)$\pi/2$

96. If the equation $ax^2+5xy-6y^2-10x+11y+c=0$ represents two perpendicular st.lines, then c=

1)6 2)-6 3)4 4)-4 [EAMCET 1999]

97. The angle between the lines represented by $y^2\cos^2\theta-xy\cos^2\theta+x^2(\sin^2\theta-1)=0$ is

1)$\pi/4$ 2) $\pi/3$ 3) $2\pi/3$ 4)$\pi/2$ [EAMCET 99]

98. If $ax^2+5xy-6y^2-10x+11y+c=0$ represents a pair of perpendicular lines, then c=

1)6 2)-6 3)4 4)-4 [EAMCET 99]

99. The equation of the pair of lines through the point (a,b) parallel to the coordinate axes is [EAMCET 2000]

1)(x-b)(y-a)=0 2)(x-a)(y+b)=0 3)(x-a)(y-b)=0 4)(x+a)(y-b)=0

100. If the equation $\lambda x^2-5xy+6y^2+x-3y=0$ represents a pair of straight lines then the point of intersection is [EAMCET 2000]

1)(-3,-1) 2)(-1,-3) 3)(3,1) 4)(1,3)

101. If the slope of one of the lines is twice the slope of the other in the pair of straight lines $ax^2+2hxy+by^2=0$ then $8h^2=$ [EAMCET 2001]

1)-9ab 2)9ab 3)7ab 4)-71b

102. The condition that one of the lines $ax^2+2hxy+by^2=0$ will bisect the angle between the coordinate axes is [EAMCET 2001]

1)$a^2+b^2=2h^2$ 2)$a^2+b^2=h^2$ 3)$(a+b)^2\backslash h^2$ 4)$(a+b)^2=4h^2$

103. The orthocenter of the triangle formed by then linesx+3y=10 and $6x^2+xy-y^2=0$ is

1)(1,3) 2)(3,1) 3)(-1,3)` 4)(1,-3) [EAMCET 2001]

104. If the pair of straight lines xy-x-y+1-0 and line ax+2y-3=- are concurrent, then a=

1)-1 2)3 3)1 4)0 [EAMCET 2002]

105. If the coordinate axes are the bisectors of the angles between the pair of lines $ax^2+2hxy+by^2=0$mwhere $h^2>ab$ and $a\neq b$, then [EAMCET 2002]

1)a+b=0 2)h=0 3)$h\neq0$,c+b=0 4)$a+b\neq0$

106. The area (in square units) of the quadrilateral formed by the two pairs of lines $l^2x^2-m^2y^2-n(lx+my)=0$ and $l^2x^2-m^2y^2+n(lx-my)=0$ is [EAMCET 2003]

1)$n^2/2|lm|$ 2)$n^2/|lm|$ 3)$n/2|lm|$ 4)$n^2/4|lm|$

107. If the pairof straight lines given by $Ax^2+2Hxy+By^2=0(H2>AB)$ forms an equilateral triangle with line $ax+by+c=0$, then $(A+3B)(3A+B)=$
1)H^2 2)$-H^2$ 3)$2H^2$ 4)$4H^2$ [EAMCET 2003]

108. The angle between the lines represented by $y^2\sin^2\theta-xy\sin^2\theta+x^2(\cos^2\theta-1)=0$is
1)$\pi/2$ 2) $\pi/6$ 3) $2\pi/3$ 4)none [EAMCET 2004]

109. Area of the triangle formed by the lines $3x^2-4xy+y^2=0,2x-y=6$ is [2004]
1)16 2)25 3)36 4)49

110. The product of the perpendicular distances from the origin on the pair of straight Lines $12x^2+25xy+12y^2+10x+11y+2=0$ is: [EAMCET 2005]
1)1/25 2)2/25 3)3/25 4)4/25

111. Let O be the origin and A be a point on the curve $y^2=4x$. Then the locus of the idpoint of OA is:
1)$x^2=4y$ 2)$x^2=2y$ 3)$y^2=16x$ 4)$y^2=2$ (2006)

112. The lines represented by the equation $x^2-y^2-x+3y-2=0$ are (2006)
1)$x+y-1=0$, $x-y+2=0$ 2)$x-y-2=0$, $x+y+1=0$
3)$x+y+2=0$, $x-y-1=0$ 4)$x-y+1=0$, $x+y-2=0$

113. The centroid of the triangle formed by the pair of lines $12x^2-20xy+7y^2=0$, and the line $2x-3y+4=0$ is (2007)
1)(-7/3,7/3) 2)(-8/3,8/3) 3)(8/3, 8/3) 4)(4/3,4/3)

114. If the lines $x^2+2xy-35y^2-4x+44y-12=0$ and $5x+\lambda y-8=0$ are concurrent, then the value of λ is (2007)
1)0 2)1 3)-1 4)2

115. The angle between the pair of line straight line formed by joining points of intersection of $x^2+y^2=4$ and $y=3x+c$ to the origin is a right angle. Then $c^2=$
1)20 2)13 3)5 4)1/5 (2007)

116. The value of λ such that $\lambda x^2-10xy+12y^2+5x-16y-3=0$ represents a pair of st.lines is
1)1 2)-1 3)2 4)-2 (2008)

117. A pair of perpendicular st.lines passes through the origin and also through the point of intersection of the curve $x^2+y^2=4$ and $x+y=a$.The set containing the value of a is (2008)
1){-2,2} 2){-3,3} 3){-4.4} 4){-5,5}

118. The value of λ with $|\lambda|<16$ such that $2x^2-10xy+12y^2+5x+\lambda y-3=0$ represents a pair of straight lines, is:
(2009)

1) –10 2) –9 3) 10 4) 9

119. The area (in square units) of the triangle formed by x + y + 1 = 0 and the pair of straight lines x2 – 3xy + 2y2 = 0 is: (2009)

1) 7/12 2) 5/12 3) 1/12 4) 1/6

120. The pairs of straight lines $x^2–3xy+2y^2=0$ and $x^2–3xy+2y^2+x–2=0$ form a: (2009)

1) square but not rhombus 2) rhombus
3) parallelogram 4) rectangle but not a square

121. The distance between the two lines represented by $8x^2 – 24xy + 18y^2 – 6x + 9y – 5 = 0$ is : (2010)

1) 0 2) $\frac{3}{4\sqrt{13}}$ 3) $\frac{6}{\sqrt{13}}$ 4) $\frac{7}{2\sqrt{13}}$

122. A pair of perpendicular lines passes through the origin and also through the points of intersection of the curve $x^2 + y^2= 4$ with x + y = a, where a > 0. Then a = (2010)

1) 2 2) 3 3) 4 4) 5

123. If $3x^2 - 11xy + 10y^2 - 7x + 3y + k = 0$ denotes a pair of straight lines, then the point of intersection of the lines is : (2010)

1) (1,3) 2) (3,1) 3) (-3, 1) 4) (1, -3)

124. If one of the lines in the pair of straight lines given by $4x^2 + 6xy + ky^2 = 0$ bisects the angle between the coordinate axes, then k = [2011]

1) {-2, -10} 2) {-2, 10} 3) {-10, 2} 4) {2, 10}

125. If $ax^2+2hxy+by^2+2gx+2fy+c=0$ represents a pair of parallel lines then $\sqrt{\frac{g^2-ac}{f^2-bc}} =$ [2011]

1) $\frac{a}{b}$ 2) $\sqrt{\frac{a}{b}}$ 3) $\sqrt{\frac{b}{a}}$ 4) $\frac{b}{a}$

126. If s and p are respectively the sum and the product of the slopes of the lines $3x^2–2xy-5y^2=0$, then s : p = [2011]

1) 4 : 3 2) 2 : 3 3) 3 : 5 4) 3 : 4

127. The distance between the parallel lines given by $(x+7y)^2 + 4\sqrt{2}(x+7y) - 42 = 0$ is [2012]

1) $\frac{4}{5}$ 2) $4\sqrt{2}$ 3) 2 4) $10\sqrt{2}$

128. If the area of the triangle formed by the pair of lines $8x^2 – 6xy + y^2 = 0$ & the line 2x + 3y = a is 7 then a = [2012]

1) 14 2) $14\sqrt{2}$ 3) $28\sqrt{2}$ 4) 28

129. If the pair of lines given by $\left(x^2+y^2\right)\cos^2\theta=\left(x\cos\theta+y\sin\theta\right)^2$ are perpendicular to each other, then $\theta=$ [2012]

1) 0 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{3}$ 4) $3\frac{\pi}{4}$

130. Given the circle C with the equation $x^2 + y^2 - 2x + 10y - 38 = 0$. Match the List – I with the List – II given below concerning C:

List – I	List – II
i) The equation of the polar of (4, 3) with respect to C	a) $y + 5 = 0$
ii) The equation of the tangent at (9, -5) on C	b) $x = 1$
iii) The equation of the normal at (- 7, - 5) on C	c) $3x + 8y = 27$
iv) The equation of the diameter of C passing through (1, 3)	d) $x + y = 3$
	e) $x = 9$

The correct answer is

	i	ii	iii	iv		i	ii	iii	iv
1)	c	a	e	b	2)	d	e	a	b
3)	c	e	a	b	4)	d	b	a	e

131. The equation of the pair of lines passing through the origin whose sum & product of slopes are respectively the arithematic mean & geometric mean of 4 & 9 is [2013]

1) $12x^2 - 13xy + 2y^2 = 0$ 2) $12x^2 + 13xy + 2y^2 = 0$
3) $12x^2 - 15xy + 2y^2 = 0$ 4) $12x^2 + 15xy - 2y^2 = 0$

132. The equation $x^2 - 5xy + py^2 + 3x - 8y + 2 = 0$ represents a pair of straight lines. If θ is the angle between them, then $\sin\theta=$ [2013]

1) $\frac{1}{\sqrt{50}}$ 2) $\frac{1}{7}$ 3) $\frac{1}{5}$ 4) $\frac{1}{\sqrt{10}}$

133. If the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a pair of straight lines, then the square of the distance of their point of intersection from the origin is [2013]

1) $\frac{c(a+b)-af^2-bg^2}{ab-h^2}$ 2) $\frac{c(a+b)+f^2+g^2}{ab-h^2}$
3) $\frac{c(a+b)-f^2-g^2}{ab-h^2}$ 4) $\frac{c(a+b)-f^2-g^2}{\left(ab-h^2\right)^2}$

134. The area (in square units) of the triangle formed by the lines $x^2-3xy+y^2=0$ & $x+y+1=0$ (2014)

1) $\frac{\sqrt{3}}{2}$ 2) $5\sqrt{2}$ 3) $\frac{1}{2\sqrt{5}}$ 4) $\frac{2}{\sqrt{3}}$

135. If $x^2 + \alpha y^2 + 2\beta y = a^2$ represents a pair of perpendicular lines, then $\beta =$ (2014)

1) a 2) 2a 3) 3a 4) 4a

136. Two pairs of straight lines with combined equation xy+4x–3y–12=0 & xy–3x+4y–12=0 form a square, then the combined equation of its diagonal is (2015)

1) $x^2 - 3x + 4y - 12 = 0$ 2) $x^2 + 2xy + y^2 + x + y = 0$

3) $x^2 - y^2 + x - y = 0$ 4) $x^2 - y^2 + x + y = 0$

137. The line $x + y = k$ meets the pair of straight lines $x^2 + y^2 - 2x - 4y + 2 = 0$ in two points A & B. If O is the origin & $\angle AOB = 90^0$ then the value of $k > 1$ is (2015)

1) 5 2) 4 3) 3 4) 2

138. The angle between the straight lines represented by $(x^2 + y^2)\sin^2\alpha = (x\cos\alpha - y\sin\alpha)^2$ is **(2015 A.P)**

1) $\frac{\alpha}{2}$ 2) α **3)** 2α 4) $\frac{\pi}{2}$

139. If the slope of one lines represented by $ax^2 - 6xy + y^2 = 0$ is the square of the other, then the value of a is **(2015 A.P)**

1) -27 or 8 2) -3 or 2 3) -64 or 27 4) -4 or 3

140. The equation of the pair of straight lines through the point (1, 1) & perpendicular to the pair of straight lines $3x^2 - 8xy + 5y^2 = 0$ is (2016)

1) $5x^2 + 8xy + 3y^2 - 14x - 18y + 16 = 0$ 2) $5x^2 + 8xy + 3y^2 - 18x - 14y + 16 = 0$

3) $5x^2 + 8xy + 3y^2 - 14x - 18y + 16 = 0$ 4) $5x^2 - 8xy + 3y^2 - 14x - 18y + 32 = 0$

141. The combined equation of the three sides of a triangle is $(x^2 - y^2)(2x + 3y - 6) = 0$. If the point $(0,\alpha)$ lies in the interior of this triangle then (2016)

1) $-2 < \alpha < 0$ 2) $-2 < \alpha < 2$ 3) $0 < \alpha < 2$ 4) $\alpha \geq 2$

142. The equation of the pair of lines joining the origin to the points of intersection of $x^2 + y^2 = 9$ & $x + y = 3$ is

1) $x^2 + (3 - y)^2 = 9$ 2) $(3 + y)^2 + y^2 = 9$ 3) $x^2 - y^2 = 9$ 4) $xy = 0$

143. The orthocenter of the triangle formed by the lines $x + y = 1$ & $2y^2 - xy - 6x^2 = 0$ is

1) $\left(\frac{4}{3},\frac{4}{3}\right)$ 2) $\left(\frac{2}{3},\frac{2}{3}\right)$ 3) $\left(\frac{2}{3},\frac{-2}{3}\right)$ 4) $\left(\frac{4}{3},\frac{-4}{3}\right)$

144. Let L be the line joining the origin to the point of intersection of the lines represented by $2x^2 - 3xy - 2y^2 + 10x + 5y = 0$. If L is perpendicular to the line $kx + y + 3 = 0$, then k =

1) $\frac{1}{2}$ 2) $\frac{-1}{2}$ 3) – 1 4) $\frac{1}{3}$

145. If $2x^2 - 10xy + 2\lambda y^2 + 5x - 16y - 3 = 0$ represents a pair of straight lines, then point of intersection of those lines is (2017)

1) (2, -3) 2) (5, -16) 3) $\left(-10, \frac{-7}{2}\right)$ 4) $\left(-10, \frac{-3}{2}\right)$

146. If the pair of straight lines $xy - x - y + 1 = 0$ & the line $x + ay - 3 = 0$ are concurrent, then the acute angle between the pair of lines $ax^2 - 13xy - 7y^2 + x + 23y - 6 = 0$ is (2017)

1) $\cos^{-1}\left(\frac{5}{\sqrt{218}}\right)$ 2) $\cos^{-1}\left(\frac{1}{\sqrt{10}}\right)$ 3) $\cos^{-1}\left(\frac{5}{\sqrt{173}}\right)$ 4) $\cos^{-1}\left(\frac{1}{\sqrt{5}}\right)$

KEY

1) 1	2) 1	3) 2	4) 1	5) 3	6) 1	7) 1	8) 4	9) 2	10) 2
11) 2	12) 3	13) 2	14) 1	15) 4	16) 3	17) 4	18) 3	19) 2	20) 2
21) 1	22) 3	23) 3	24) 3	25) 3	26) 3	27) 1	28) 1	29) 4	30) 1
31) 3	32) 2	33) 4	34) 2	35) 4	36) 2	37) 4	38) 2	39) 3	40) 1
41) 4	42) 2	43) 3	44) 2	45) 2	46) 3	47) 1	48) 3	49) 4	50) 3
51) 2	52) 2	53) 3	54) 4	55) 1	56) 2	57) 2	58) 4	59) 2	60) 3
61) 2	62) 1	63) 2	64) 2	65) 1	66) 2	67) 4	68) 4	69) 1	70) 1
71) 2	72) 1	73) 2	74) 3	75) 4	76) 2	77) 1	78) 4	79) 3	80) 1
81) 3	82) 2	83) 3	84) 1	85) 2	86) 4	87) 3	88) 2	89) 2	90) 2
91) 1	92) 3	93) 1	94) 3	95) 4	96) 4	97) 4	98) 4	99) 3	100) 1
101) 2	102) 4	103) 1	104) 3	105) 2	106) 1	107) 4	108) 1	109) 3	110) 2
111) 2	112) 4	113) 3	114) 2	115) 1	116) 2	117) 1	118) 2	119) 3	120) 3
121) 4	122) 1	123) 2	124) 3	125) 2	126) 2	127) 3	128) 4	129) 2	130) 3
131) 1	132) 1	133) 3	134) 1	135) 3	136) 3	137) 4	138) 3	139) 1	140)2
141) 3	142) 4	143) 1	144) 2	145) 3	146) 2	147)	148)	149)	

AIEEE PROBLEMS

1. The angle between the straight lines $x^2 + 4xy + y^2 = 0$ is [AIEEE 2002]

1) 30^0 2) 45^0 3) 60^0 4) 90^0

2. The distance between the pair of parallel lines $9x^2 - 24xy + 16y^2 - 12x + 16y - 12 = 0$ [AIEEE 2002]

1) 5 2) 8 3) 8/5 4) 5/8

3. The equation of the pair of bisectors of the angles between the pair of lines $x^2 - 2axy - y^2 = 0$ is $x^2 - 2bxy - y^2 = 0$. Then [AIEEE 2003]
1) ab = 1 2) ab + 1 = 0 3) ab = 2 4) ab + 2 = 0

4. If one of the lines given by $6x^2 - xy + 4cy^2 = 0$ is 3x + 4y = 0, then *c* = [AIEEE 2004]
1) 1 2) -3 3) 3 4) -1

5. If the sum of the slopes of the lines given by $x^2 - 2csy - 7y^2 = 0$ is four times their product, then *c* has the value [AIEEE 2004]
1) 1 2) -2 3) 2 4) -1

6. If one of the lines of $my^2 + (1 - m^2)xy - mx^2 = 0$ is a bisector of the angle between the lines xy = 0, then *m* is [AIEEE 2007]
1) -1/2 2) -2 3) 1 4) 2

KEY

1) 3	2) 3	3) 2	4) 2	5) 3	6) 1

21. THREE DIMENTIONAL COORDINATES

1. The distance between the points (x_1,y_1,z_1) and (x_2,y_2,z_2) is

$$\sqrt{(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2}$$

2. The coordinates of the point which divides the line segment joining the points $(x_1,y_1,z_1)$and (x_2,y_2,z_2) internally in the ratio m:n are

$$\left(\frac{mx_2+nx_1}{m+n}, \frac{my_2+ny_1}{m+n}, \frac{mz_2+nz_1}{m+n}\right)$$

3. The coordinates of the point which divides the line segment joining the points (x_1,y_1,z_1) and (x_2,y_2,z_2) externally in the ration m:n are

$$\left(\frac{mx_2-nx_1}{m-n}, \frac{my_2-ny_1}{m-n}, \frac{mz_2-nz_1}{m-n}\right)$$

4. The mid point of the line joining the points (x_1,y_1,z_1) and (x_2,y_2,z_2) is

$$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}, \frac{z_1+z_2}{2}\right)$$

5. The centroid of the triangle formed by the points (x_1,y_1,z_1) , (x_2,y_2,z_2) and (x_3,y_3, z_3) is

$$\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}, \frac{z_1+z_2+z_3}{3}\right)$$

6. If the points $A(x_1,y_1,z_1)$, $B(x_2,y_2,z_2)$ and $C(x_3,y_3,z_3)$ are collinear points then AB : BC= $(x_1-x_2) : (x_2-x_3)$ (Or)AB : BC = $(y_1-y_2) : (y_2-y_3)$ (Or) AB : BC = $(z_1-z_2) : (z_2-z_3)$

7. Let $A(x_1,y_1,z_1)$ and $B(x_2,y_2,z_2)$ be two points. Then
   i) yz plane divides the lines segment AB in the ratio $-x_1 : x_2$
   ii) zx plane divides the line segment AB in the ratio $-y_1 : y_2$
   iii) xy plane divides the line segment AB in the ratio $-z_1 : z_2$

8. The non intersecting lines in space are called skew lines.

9. If $P(x_1,y_1,z_1)$ $Q(x_2,y_2,z_2)$ $R(x_3,y_3,z_3)$ & $S(x_4,y_4,z_4)$are the vertices of a tetrahedron, its centroid is given $\left(\frac{x_1+x_2+x_3+x_4}{4}, \frac{y_1+y_2+y_3+y_4}{4}, \frac{z_1+z_2+z_3+z_4}{4}\right)$

10. The centroid G of the tetrahedron ABCD divides the line joining any vertex to the centroid of its opposite face in the ratio 3:1.

11. The equation of thr straight line passinf through the points $A(x_1,y_1,z_1)$, $B(x_2,y_2,z_2)$ are $\frac{x-x_1}{x_2-x_1}=\frac{y-y_1}{y_2-y_1}=\frac{z-z_1}{z_2-z_1}$.

12. The points $A(x_1,y_1,z_1)$, $B(x_2,y_2,z_2)$, $C(x_3,y_3,z_3)$ are collinear iff

$$\begin{vmatrix} x_1 & x_2 & x_3 \\ y_1 & y_2 & y_3 \\ z_1 & z_2 & z_3 \end{vmatrix} = 0$$

13. If the coordinates (x,y,z) of a point are transformed to (X,Y,Z), when the axes are translated to the point (h,k,l), then x =X+h, y = Y+k , z =Z+*l*.

Exercise

1. If P=(0,0,l) and Q=(2, 2,-1), the distance between PQ is
   1)9 2) $\sqrt{12}$ 3)5 4)1

2. If the axes are shifted to (-4, 3, 9), the new co-ordinates of P (1,-5, 3) are
   1)(5,-8,-6) 2)(-5,8,6) 3)(-3,-2,12) 4)(-3/2,-1,6)

3. The point which divides the line segment joining (-1, 0, 7) and (3, 1, 2) in the ratio 2:1 is
   1) (5/3, 2/3,-11/3) 2) (5/3, 2/3, 11/3) 3) (7/3, 2/3,-5/3) 4) (5/3, 2/3,-5/3)

4. If (3,-9, 11) and (-2, 5, 7) are two vertices of a triangle for which (-3, 0, 3) is the centroid, then its third vertex is
   1) (10,-4, 9) 2) (10, 4,-9) 3) (-10, 4,-9) 4) (-10,-4,-9)

5. If (3, 2,-1), (4, 1, 1) and (6, 2, 5) are three vertices of a tetrahedron whose centroid is (4, 2, 2) the fourth vertex is
   1) (3, 3, 3) 2) (3, 4, 5) 3) (-3, 3, 3) 4) (3, 3,-3)

6. The ratio in which XOZ plane divides the line segment joining (1, 2, 3) and (7, 6, 1) is
   1) 1:3 2) -3:1 3) -1:7 4) -1:3

7. If θ is the angle between any two diagonals of a cube then cos θ=
   1) 1/6 2) 1/3 3) 4) 0

8. The foot of the perpendicular from A on BC , where A= (3,-1,1), B= (0, 2, 3) and C = (4, 8, 11) is
1) (-2,-5,7) 2) (2,5,7) 3) (-2,5,7) 4) (2,-5,7)

9. The projection of AB on CD where A= (4,3,5) , B=(6,4,5) , C= (2,-1,4) and D = (0,1,5) is
1) 1 2) 4/3 3) 2/3 4) 0

10. If a line L has D.C's (2/7,-3/7,6/7) and P= (5,2,4) then the projection of OP on L is
1) 4 2) 13 3) 28 4) 7

11. The foot of the perpendicular of P(4,5,6) on OA where A= (1,2,3) is
1) (4/5, 5/7, 6/7) 2) (5/7, 1, 9/7) 3) (5/7, 1, 9/7) 4) (16/7, 32/7, 48/7)

12. The points A(3,2,-4),B(5,4,-6) and C(9,8,-10) form
1) Isosceles triangle 2) equilateral triangle
3) collinear points 4) Right angled triangle

13. The points (1,-1,-5), (3,1,3) and (9,1,-3) form
1) Isosceles triangle 2) equilateral triangle 3) right angled triangle
4) Scalene triangle.

14. The points A(2,9,12), B(1,8,8), C(-2,11,8) and D(-1,12,12) form
1) A parallelogram 2) a rhombus 3) a square 4) a rectangle

15. The points (3,5,-2),(2,2,0) and (5,11,-6) are
1) Collinear 2) not collinear 3) vertices of right angled triangle
4) Vertices of equilateral triangle

16. If the distance between the points (1,1,k) and (3,5,-2) is 7, then k=
1)-4 or 8 2)4 or -8 3)-4 or 8 4) 4 or 8

17. If (1,2,3), (2,3,1) are the two vertices of an equilateral triangle, then its third vertex is
1)(3,1,2) 2)(-1,1,2) 3)(3,1,4) 4)(1,4,0)

18. The circumcentre of the triangle formed by the points (1,2,3), (3,1,2) (2,3,1) is
1)(2,2,2) 2)(1,1,1) 3)(3,3,3) 4)(0,0,0)

19. The points A(3,4,5), B(2,3,1), C(-1,6,1) form
1) Equilateral triangle 2) collinear points
3) isosceles triangle 4) Isosceles right angled triangle.

20. If P,Q are the feet of the perpendiculars from (2,4,5) to the xy plane and yz-plane respectively, then the distance PQ is

1)$\sqrt{41}$ 2)$\sqrt{20}$ 3)$\sqrt{29}$ 4)$\sqrt{40}$

21. If A,B are the feet of the perpendiculars from P(2,4,5) to the x-axis and Y-axis respectively then the distance AB is
1)$2\sqrt{5}$ 2)$\sqrt{29}$ 3)$\sqrt{41}$ 4)$\sqrt{42}$

22. The perimeter of the triangle formed by the points (2,5,3),(5,3,2),(3,2,5) is
1)$\sqrt{14}$ 2)$3\sqrt{14}$ 3)$3\sqrt{6}$ 4)$3\sqrt{12}$

23. The perimeter of the triangle whose vertices are (1,0,0),(0,1,0) and (0,0,1) is
1)$\sqrt{2}$ 2)$2\sqrt{2}$ 3)$2+\sqrt{2}$ 4)$3\sqrt{2}$

24.he point at which the axis are translated to remove first degree terms is

List-I	List-II
A)$x^2+y^2+z^2-2x-4y+2z-3=0$	1)(-1,-2,1)
B)$x^2+y^2-z^2+2x+4y+2z+3=0$	2)(1,2,1)
C)$2x^2-2y^2+z^2-4x+8y-2z-5=0$	3)(-1,1,2)
D)$2x^2-3y^2+z^2+4x+6y-4z-2=0$	4)(1,2,-1)

		A	B	C	D		A	B	C	D
1)	4	1	2	3	2)	1	2	3	4	
3)	4	3	2	1	4)	1	3	4	2	

25. Assertion : P(3,5,4),Q(5,7,5),R(6,5,7) are the vertices of a triangle whose orthocenter is (5,7,5)
Reason: In a right angled triangle right vertex is orthocenter
1)Both A and R are true and R is the correct explanation of A
2)Both A and R are true but R is not the correct explanation of A
3)A is true but R is false 4)A is false but R is true

PREVIOUS EAMCET PROBLEMS

26. The direction ratios of two lines are given by a+b+c=0 and 2ab+2ac-bc=0 then the angle between two lines is (2001)
1)π 2)$2\pi/3$ 3)$\pi/2$ 4) $\pi/3$

27. If a line makes angles $\pi/3$and $\pi/4$ with x axis and y-axis respectively. Then the angle made by the line with z-axis is (2001)
1)$\pi/2$ 2)$\pi/3$ 3)$\pi/4$ 4)$5\pi/12$

28. If P=(0,1,2),Q=(4,2,1),O=(0,0,0) then $\angle POQ$=__ (2001)
1)$\pi/6$ 2)$\pi/4$ 3)$\pi/3$ 4) $\pi/2$

29. The point collinear with (1,-2,-3) and (2,0,0) among the following is (2005)
1)(0,4,6) 2)(0,-4,-5) 3)(0,-4,-6) 4)(0,-4,6)

30. If the direction cosines of two lines are such that $l+m+n=0$, $l^2+m^2-n^2=0$, then the angle between them is : (2006)
1)$\pi/2$ 2)$\pi/3$ 3)$\pi/4$ 4)$\pi/6$

31. If AO is equally inclined to *OX,OY* AND *OZ* and if A is $\sqrt{3}$ units from the origin then A is
1)(3,3,3) 2)(-1,1,-1) 3)(-1,1,1) 4)(1,1,1) (2006)

32. The ratio in which *yz*- plane divides the line segment joining (-3,4,2),(2,1,3) is
1)-4:1 2)3:2 3)-2:3 4)1:2 (2007)

33. In triangle ABC the mid-points of the sides AB,BC and CA are respectively (l,0,0),(0,m,0) and (0,0,n) then $\frac{AB^2+BC^2+CA^2}{l^2+m^2+n^2}$ (2008)
1)2 2)4 3)8 4)16

33. The perimeter of the triangle with vertices at (1, 0, 0), (0, 1, 0) and (0, 0, 1) is(2009)
1)3 2) 2 3) $2\sqrt{2}$ 4) $3\sqrt{2}$

34. The point dividing the join of (3, -2, 1) and (-1, 3,11) in the ratio 2 : 3 is
1) (1, 1, 4) 2) (1, 0, 5) 3) (2, 3, 5) 4) (0, 6, -1) (2010)

35. If x-coordinate of a point P on the line joining the points Q(2, 2, 1) & R(5, 1, -2) is 4, then the z-coordinate of P is [2012]
1) – 2 **2) – 1** 3) 1 4) 2

36. If D(2, 1, 0), E(2, 0, 0), F(0, 1, 0) are mid-points of the sides BC, CA, AB of ΔABC respectively. Then, the centroid of ΔABC is [2013]
1) $\left(\frac{1}{3},\frac{1}{3},\frac{1}{3}\right)$ **2)** $\left(\frac{4}{3},\frac{2}{3},0\right)$ 3) $\left(-\frac{1}{3},\frac{1}{3},\frac{1}{3}\right)$ 4) $\left(\frac{2}{3},\frac{1}{3},\frac{1}{3}\right)$

37. If the line joining A(1, 3, 4) & B is divided by the point (-2, 3, 5) in the ratio 1:3 then B is (2014)
1) (-11, 3, -8) 2) (-8, 12, 20) 3) (13, 6, -13) 4) (-11, 3, 8)

38. If the extremities of diagonal of a squares are (1, 2, 3) & (2, -3, 5), then its side of length (2015)
1) $\sqrt{6}$ 2) 15 3) $\sqrt{15}$ 4) 3

39. If (2, -1, 2) & (k, 3, 5) are the trads of direction ratios of two lines & the angle between them is 45^0, then a value of k is (2015 A.P.)
1) 2 2) 3 3) 4 4) 6

40. Point A(3, 2, 4), B(33/5, 28/5, 38/5). & C(9, 8, 10) are given. The ratio in which B divides AC is (2016)
1) 5 : 3 2) 2 : 1 3) 1 : 3 4) 3 : 2

41. The harmonic conjugate of (2, 3, 4) with respect to the point (3, -2, 2), (6, -17, -4) is (2017)

1) $\left(\frac{1}{2},\frac{1}{3},\frac{1}{4}\right)$ 2) $\left(\frac{18}{5},-5,\frac{4}{5}\right)$ 3) $\left(\frac{-18}{5},\frac{5}{4},\frac{4}{5}\right)$ 4) $\left(\frac{18}{5},-5,\frac{-4}{5}\right)$

42. A parallelogram has vertices A(4, 4, -1), B(5, 6, -1), C(6, 5, 1) & D(x, y, z). Then the vertex D is (2017)

1) (5, 1, 0) 2) (-5, 0, 1) 3) (5, 3, 1) 4) (5, 1, 3)

43. In the triangle with vertices A(3, 2, 0), B(5, 3, 2) & C(-9, 6, -3), the bisector of $\angle BAC$ meets BC at D. The coordinates of D are (2017AP)

1) $\left(\frac{57}{16},\frac{38}{16},\frac{17}{16}\right)$ 2) $\left(\frac{38}{16},\frac{57}{16},\frac{17}{16}\right)$

3) $\left(\frac{38}{16},\frac{17}{16},\frac{57}{16}\right)$ 4) $\left(\frac{17}{16},\frac{38}{16},\frac{57}{16}\right)$

KEY

1) 2	2) 1	3) 2	4) 3	5) 1	6) 4	7) 2	8) 2	9) 3	10) 4
11) 4	12) 3	13) 2	14) 2	15) 1	16) 2	17) 1	18) 1	19) 4	20) 3
21) 1	22) 2	23) 4	24) 1	25) 1	26) 2	27) 2	28) 4	29) 3	30) 2
31) 4	32) 2	33) 3	34) 4	35) 1	36) 2	37) 4	38) 3	39) 3	40)4
40) 2	41) 2	42) 3	43) 2	44)	45)	46)	47)	48)	

AIEEE PROBLEMS

1. The coordinates of the point which divides the line joining the points (2, 3, 4) and (3, -4, 7) in the ratio 2 : 4 externally is [2002]

1) (10, 1, 1) 2) (1, 10, 1) 3) (10, -10, 10) 4) (1, 1, 10)

KEY 1) 2

ADDITIONAL PROBLEMS

1. If A(1,2,3),B(0,1,2)and C(2,1,0) are vertices of a triangle, then the length of the median through A is

1)√5 2)2√5 3)5 4)10

2. If A(1,1,3),B(4,3,2) and C(5,2,8) are three vertices of a tetrahedron for which the centroid is (4,5/2,5), the fourth vertex is

1)(6,5,8) 2)(6,4,8) 3)(5,4,8) 4)(6,4,5)

3. The points (2,5,-4,),(4,7,-6),(1,4,-3) are

1)collinear 2)vertices of a right angled triangle
3)vertices of an equilateral triangle 4)vertices of an isosceles triangle

4. The point which divides the line segment joining the points(-2,3,5),(1,2,3) in the ratio 2:3 externally is
1)(-4/5,13/5,21/5) 2)(13/7,2/7,15/7) 3)(-3/2,1/2,9) 4)(-8,5,9)

5. If A(5,3,2),B(-1,0,-4),C(1,1,-2) are collinear, then the ratio in which B divides AC is
1)1:3 2)2:3 3)3:-1 4)1:2

6. I: The distance between the points (-2,1,-3),(4,3,-6) is 7.
II: If the distance between the points (-1,2,3) and (c,5,1) is 9 then c=8.
1) only I is true 2)only II is true
3) both I and II are true 4) neither I nor II are true

7. Match the following

Given points	Distance between the points
I. Origin,(2,-1,3)	a) $\sqrt{2}$
II.(-1,2,-3),(5,4,-6)	b) $\sqrt{14}$
III. ($\sin\alpha,\cos\alpha,0$),($\cos\alpha,-\sin\alpha,0$)	c)7

1)b,c,a 2)c,a,b 3)b,a,c 4)a,b,c

8. A(2,3,4),B(-1,2,3) then the length of projection on

I. xy-plane	a) $\sqrt{2}$
II. yz-plane	b) $\sqrt{5}$
III.zx-plane	c) $\sqrt{10}$

1)c,b,a 2)a,b,c 3)c,a,b 4)b,c,a

10. If A,B,C are the points (0,4,1),(2,3,-1),(4,5,0) respectively, then angle between $\overleftrightarrow{AB}$ and $\overleftrightarrow{BC}$ is
1)$\pi/6$ 2)$\pi/3$ 3)$\pi/2$ 4)$\pi/4$

10. The foot of the perpendicular from (1,2,3) to the line joining the points (6,7,7)and (9,9,5) is
1)(5,3,9) 2)(3,5,9) 3)(3,9,5) 4)(3,99)

11. If the line joinng the points (-1,2,3),(2,-1,4) is perpendicular to the line joining the points (x,-2,4),(1,2,3) thenx=
1)3 2)10 3)-3/10 4)-10/3

12. If the d.c.'s (l,m,n) of two lines are connected by the relations 2l-m+2n=0 and mn+nl+lm=0 then the angle between the lines is
1)$\pi/4$ 2)$\pi/3$ 3)$\pi/6$ 4)$\pi/2$

KEY

1) 1	2) 2	3) 1	4) 4	5) 3	6) 3	7) 1	8) 1	9) 3	10) 2
11) 4	12) 4								

22. DIRECTION COSINES AND DIRECTION RATIOS

1. If α, β, γ are the angles made by the line AB with axes OX,OY,OZ respectively then cos α, cos β , cos γ are called the direction cosines of the line AB.

2. cos α, cos β, cos γ are denoted by the letters 1,m,n and $l^2 + m^2 + n^2 = 1$.

3. On x-axis direction cosines are (1,0,0)
   On y-axis direction cosines are (0,1,0)
   On z-axis direction cosines are (0,0,1).

4. If 0= (0,0,0) and P= (x,y,z) then direction cosines of OP are x/r , y/r , z/r where OP=r.

5. If a, b, c are direction ratios of the line AB then the direction cosines of the line AB are

$$\left[\pm \frac{a}{\sqrt{a^2+b^2+c^2}}, \pm \frac{b}{\sqrt{a^2+b^2+c^2}}, \pm \frac{c}{\sqrt{a^2+b^2+c^2}} \right]$$

6. The direction ratios of the line joining the points (x_1,y_1,z_1) and (x_2,y_2,z_2) are $(x_2-x_1 , y_2-y_1, z_2-z_1)$.

7. The projection of the line joining the points $A(x_1,y_1,z_1)$ and $B(x_2,y_2,x_2)$ on the line whose direction cosines are l, m, n is $| l (x_1-x_2) + m(y_1-y_2) + n(z_1-z_2) |$.

8. If θ is the angle between two lines whose direction ratios are (a_1,b_1,c_1) and (a_2,b_2,c_2) then

   $$\text{Cos } \theta = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\sqrt{a_2^2 + b_2^2 + c_2^2}}$$

   If the lines are perpendicular then $a_1a_2+b_1b_2+c_1c_2=0$.
   If the two lines are parallel then $a_1/a_2=b_1/b_2=c_1/c_2$.

9. If $P(x_1,y_1,z_1)$, $Q(x_2,y_2,z_2)$, $R(x_3,y_3,z_3)$ and $S(x_4,y_4,z_4)$are the vertices of a tetrahedron then its centroid is given as

   $$\left(\frac{x_1 + x_2 + x_3 + x_4}{4}, \frac{y_1 + y_2 + y_3 + y_4}{4}, \frac{z_1 + z_2 + z_3 + z_4}{4} \right)$$

10. If θ is the angle between two lines whose direction cosines are l_1,m_1,n_1 and l_2,m_2,n_2 then $\text{Cos } \theta = l_1l_2+m_1m_2+n_1n_2$ and

---

11. The equation of the straight line passing through the point $A(x_1,y_1,z_1)$ and having direction cosines (l,m,n) are $\frac{x-x_1}{l}=\frac{y-y_1}{m}=\frac{z-z_1}{n}$.

12. The equation of straight line passing through the point $A(x_1,y_1,z_1)$ and having direction ratio (a,b,c) are $\frac{x-x_1}{a}=\frac{y-y_1}{b}=\frac{z-z_1}{c}$

13. The equation of thr straight line passinf through the points $A(x_1,y_1,z_1)$, $B(x_2,y_2,z_2)$ are $\frac{x-x_1}{x_2-x_1}=\frac{y-y_1}{y_2-y_1}=\frac{z-z_1}{z_2-z_1}$.

14. Any point on the line passing through (x_1,y_1,z_1) and having direction cosines (l,m,n) is of the form (x_1+lr, y_1+mr, z_1+nr) where r is a parameter.

15. The equations $x = x_1+lr$, $y= y_1+mr$, $z = z_1+nr$ where r is a parameter, are called parametric equations of a line.

16. The points $A(x_1,y_1,z_1)$, $B(x_2,y_2,z_2)$, $C(x_3,y_3,z_3)$ are collinear iff

$$\begin{vmatrix} x_1 & x_2 & x_3 \\ y_1 & y_2 & y_3 \\ z_1 & z_2 & z_3 \end{vmatrix}=0$$

17. The number of lines which are equally inclined to the coordinate axes is 4.

18. The d.c's of aline which is equally inclined to the coordinate axes are $\left(\pm\frac{1}{\sqrt{3}},\pm\frac{1}{\sqrt{3}},\pm\frac{1}{\sqrt{3}}\right)$.

19. If (l,m,n) are d.c.'s of a line then the maximum value of lmn is $\frac{1}{3\sqrt{3}}$.

20. If the d.c's (l,m,n) of two lines are connected by the relations al+bm+cn =0 and fmn +gnl +hlm =0 then the two lines are
i) perpendicular if $a^2(v+w)+b^2(u+w)+c^2(u+v)=0$
ii)parallel if $a^2/u+b^2/v+c^2/w=0$

20. i) The aangle between any two diagonals of a cube is $\cos^{-1}(1/3)$.
ii) The angle between a diagonal of a cube and the diagonal of a face of the cube is $\cos^{-1}\sqrt{2/3}$
iii) A line makes angles $\alpha,\beta,\gamma,\delta$ with the four diagonal of a cube, then $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = 4/3$.

21. If the edges of a rectangular parallelopiped are a,b,c then the angles between the four diagonals are given by $\cos^{-1}\left(\frac{\pm a^2 \pm b^2 \pm c^2}{a^2+b^2+c^2}\right)$

22. If the projections of a line of length d on the coordinates axes are d_1, d_2 and d_1, d_2 *and* d_3 respectively, then $d_1^2 + d_2^2 + d_3^2 = d^2$.

Exercise-A

1. The direction numbers of a line are 2, 2, and 1. The direction cosines of the lines are
1)2/3, 2/3, 1/3 2)6/√3, 2/√3, 3/√3 3)6/√7, 2/√7, -3/7 4)6/3, 2/3, 1/3

2. If P= (1,-2, 2) then the d.cs. of OP are
1)1/9,-2/9, 2/9 2)1/3,-2/3, 2/3 3)1/3, 2/3, 2/3 4)2/3, 2/3, 1/3

3. If OP=13 and d.rs. of OP are 6,8,-24 then the point P =
1) (6, 8,-24) 2)(2,8/3,-8) 3)(3,4,-12) 4)(1,2,3)

4. If α, β,γ are the angles made by a line with the positive directions of the coordinates, then $\sin^2\alpha+\sin^2\beta+\sin^2\gamma =$
1)0 2)1 3)2 4)3

5. If a line makes $30^0, 60^0$ with the positive direction of the x-axis and Y-axis respectively, then the angle made by the line with positive Z-axis is
1)30^0 2)45^0 3)60^0 4)0^0

6. If a line makes $45^0, 90^0$ with the positive directions of the x-axis and y-axis respectively, then the angle made by the line with positive z-axis is
1)30^0 2)45^0 3)60^0 4)0^0

7. A directed line makes 60^0, 135^0 with the x and y axes respectively. The angle it makes with z-axis is
1)60^0 or 90^0 2)45^0 or 135^0 3)60^0 or 120^0 4)180^0

8. The number of lines which are equally inclined to the coordinate axis is
1)3 **2)4** 3)5 4)6

9. The d.cs. of a line which is equally inclined to the coordinate axes are
1)1/√3, 1/√3, 1/√3 2)2/3, 2/3, 2/3 3)1/4, 1/4, 1/4
4)1/5, 1/5, 1/5

10. If the d.cs. of the line joining the points P(4,3,5) and Q(1,1,k) are 3/7,2/7,6/7 then k=
1)-1 2)11 3)1 4)-11

11. If the line joining the points (k,2,3),(1,1,2) is parallel to the line joining the points (5,4,-1), (3,2,-3) and k =
1)-2 2)2 3)1 4)-1

12. If l_1,m_1,n_1 and l_2,m_2,n_2 are the d.cs of two lines, then $(l_1l_2+m_1m_2+n_1n_2)^2 + (l_1m_2-l_2m_1)^2 + (m_1n_2-m_2n_1)^2 + (n_1l_2-n_2l_1)^2 =$
1)4 2)2 3)1 4)3

13. If the d.rs. of the two lines are 1,2,1 and 2,1,-1 then the angle between lines is
1)90^0 2)30^0 3)45^0 4)60^0

14. If the d.rs. of the two lines are (1,1,2) and (√3-1,-√3-1,4) then the angle between the lines is
1)120^0 2)90^0 3)60^0 4)30^0

15. If the d.rs. of the two lines are (3,4,5)and (6,6,3), then the angle made between the lines is
1) $\cos^{-1}(15/19)$ 2) $\cos^{-1}(15/19\sqrt{2})$ 3) $\cos^{-1}(19/15\sqrt{2})$ 4) $\cos^{-1}(0)$

16. If the d.rs. of the two lines are (1, 1, 2); (-1, 2, 1) then the d.cs. of a line which is perpendicular to both of them are
1)1/√3, 1/√3, -1/√3 2) -1/√3, - 1/√3, 1/√3
3) 1/√3, -1/√3, 1/√3 4) 1/√3, 1/√3, 1/√3

17. If the d.rs. of OA and OB are (1,1,-1) and (1,-2,1) then the d.cs of the normal to the plane AOB are
1)1/√14, 2/√14, 3/√14 2)2/√29, 3√29, 4/√29
3) 1/√14,-2/√14, 3/√14 4) -2/√29,-3√29, 4/√29

18. If the d.cs. l,m,n of two lines are connected by the relations l+m+n=0 and $l^2-m^2+n^2=0$ then the angle between the lines is
1)30^0 2)45^0 3)90^0 4)120^0

19. If the d.cs. l,m,n of two lines are related as l+m+n=0 and 2lm-mn+2nl =0, then the angle between the lines is
1)30^0 2)45^0 3)90^0 4)120^0

20. The angle between a diagonal of a cube and the diagonal of a face of the cube is
1) $\cos^{-1}(1/3)$ 2) $\cos^{-1}(\sqrt{2}/3)$ 3) $\cos^{-1}(1/\sqrt{3})$ 4) $\cos^{-1}(2/3)$

21. If the edges of rectangular parallelepiped are 3,2,1 then the angle between two diagonals out of four diagonals is
1) cos-1(6/7) 2) cos-1(2/3) 3) cos-1(13/14) 4) cos-1(9/14)

22. If the d.cs. of the two lines are (2/3,2/3,1/30); (95/13, 12/13) then the d.rs. of the line bisecting the angle between the lines are
1) 40,60,13 2) 41,60,10 3) 41,62,13 4) 44,69,89

23. If the d.rs. of two lines are 2,1,-2 and 3,-2,6 then the d.rs. of the line bisecting the angle between the lines are
1)23,-1, 4 2) 23, 1, -4 3) 23,-1,-4 4) 23, 1, 4

24. If the projections of a line segment on the axis are 1,5,7 respectively, then the length of the line segment is
1)$3\sqrt{3}$ 2)$4\sqrt{3}$ 3)$5\sqrt{3}$ 4)$6\sqrt{3}$

25. The projection of the line joining A(3,4,6) and B(2,1,3) on the line having 2,3,-6 as its d.rs. is
1)3/7 2)1 3)9/7 4)11/7

26. The projection of the line joining A(1,1,2) and B(3,3,4) on the line whose d.rs. are 1,-1,1 is
1)$2/\sqrt{3}$ 2)$1/\sqrt{3}$ 3) $\sqrt{3}$ 4)$2\sqrt{3}$

27. The d.cs of two lines $L_1$and L_2 are 2,1,-2 and 3,-2,-6 then

List-I	List-II
A)d.rs of a line normal to $L_1$and L_2 is	1)-10,6,-7
B)d.rs of a line bisecting the angle is Between L_1 and L_2 is	2)2,3,1,4
C) d.rs of a line Perpendicular to L_1	3)1,1,3/2
D) d.rs of a line Perpendicular to L_1	4)2,3,0

	A	B	C	D		A	B	C	D
1) 1	2	3	4		2) 2	1	4	3	
3) 3	2	4	1		4) 4	3	2	1	

28. Assertion(A): The points A(2,3,5),B(4,6,10),C(8,12,20) are collinear.
Reason(R): Two lines will be parallel if their d.rs are proportional
1)Both A and R are true and R is the correct explanation of A
2)Both A and R are true but R is not the correct explanation of A
3)A is true but R is false 4)A is false but R is true

PREVIOUS EAMCET PROBLEMS

29 The direction ratios of two lines are given by a+b+c=0 and 2ab+2ac-bc=0 then the angle between two lines is (2001)
1)π 2)2π/3 3)π/2 4) π/3

30. If a line makes angles π/3and π/4 with x axis and y-axis respectively. Then the angle made by the line with z-axis is (2001)
1)π/2 2)π/3 3)π/4 4)5 π/12

31. If P=(0,1,2),Q=(4,2,1),O=(0,0,0) then ∠POQ=__ (2001)
1)π/6 2)π/4 3)π/3 4) π/2

32. The acute angle between two lines whose d.rs are given by l+m-n=0 and $l^2+m^2-n^2=0$ is
1)0 2)π/6 3)π/4 4) π/3 (2001)

33. If the direction ratios of two lines are given by 3lm-4ln+mn=0 and l+2m+3n=0 then angle between the lines is (2003)
1)π/2 2)π/3 3)π/4 4) π/6

34. If the d.rs of two lines are given by l+m+n=0 mn-2ln+lm=0 then the angle between the lines is (2004)
1)π/4 2)π/3 3)π/2 4)0

35. The direction cosines of the line passing through p(2,3,-1) and the origin are (2005)
1)2/√14,3/√14,1/√14 2)2/√14,-3/√14,1/√14
3)-2/√14,-3/√14,1/√14 4)2/√14,-3/√14,-1/√14

36. The point collinear with (1,-2,-3) and (2,0,0) among the following is (2005)
1)(0,4,6) 2)(0,-4,-5) 3)(0,-4,-6) 4)(0,-4,6)

37. If the direction cosines of two lines are such that l+m+n=0, $l^2+m^2-n^2=0$, then the angle between them is : (2006)
1)π/2 2)π/3 3)π/4 4)π/6

38. The cosine of the angle A of the triangle with vertices A(1,-1,2) ,B(6,11,2) C(1,2,6) is
1)36/65 2)36/65 3)16/65 4)13/64 (2007)

39. The ratio in which *yz*- plane divides the line segment joining (-3,4,2),(2,1,3) is
1)-4:1 2)3:2 3)-2:3 4)1:2 (2007)

40. The direction cosines of the line passing through p(2,3,-1) and the origin are(2005)
1)$2/\sqrt{14}, 3/\sqrt{14}, 1/\sqrt{14}$ 2)$2/\sqrt{14}, -3/\sqrt{14}, 1/\sqrt{14}$
3)$-2/\sqrt{14}, -3/\sqrt{14}, 1/\sqrt{14}$ 4)$2/\sqrt{14}, -3/\sqrt{14}, -1/\sqrt{14}$

41. If the direction cosines of two lines are such that $l+m+n=0$, $l^2+m^2-n^2=0$, then the angle between them is : (2006)
1)$\pi/2$ 2)$\pi/3$ 3)$\pi/4$ 4)$\pi/6$

42. The cosine of the angle A of the triangle with vertices A(1,-1,2) , B(6,11,2), C(1,2,6) is (2007)
1) $\frac{63}{65}$ 2) $\frac{36}{65}$ 3) $\frac{16}{65}$ 4) $\frac{13}{64}$

43. The angle between the lines whose directions cosines are $\left(\frac{\sqrt{3}}{4}, \frac{1}{4}, \frac{\sqrt{3}}{2}\right)$ and $\left(\frac{\sqrt{3}}{4}, \frac{1}{4}, \frac{-\sqrt{3}}{2}\right)$ is (2008)
1)π 2)$\pi/2$ 3)$\pi/3$ 4)$\pi/4$

44. The angle between the lines whose direction cosines satisfy the equations
$l+m+n=0$,
$l^2+m^2-n^2=0$ is: [2009]
1) $\frac{\pi}{6}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{2}$

45. If a line in the space makes angles α, β and γ with the coordinates axes, then $\cos 2\alpha+\cos 2\beta+\cos 2\gamma+\sin^2\alpha+\sin^2\beta+\sin^2\gamma =$ [2009]
1) –1 2) 0 3) 1 4) 2

46. The image of the line x + y + z – 2= 0 in the Y – axis is : [2010]
1) x – y + = 0 2) y – x + 2 = 0
3) x + y + 2 = 0 4) x + y – 2 = 0

47. If x-coordinate of a point P on the line joining the points Q(2, 2, 1) & R(5, 1, -2) is 4, then the z-coordinate of P is [2012]
1) – 2 2) – 1 3) 1 4) 2

48. D(2, 1, 0), E(2, 0, 0), F(0, 1, 0) are mid-points of the sides BC, CA, AB of ΔABC respectively. Then, the centroid of ΔABC is [2013]
1) $\left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$ 2) $\left(\frac{4}{3}, \frac{2}{3}, 0\right)$ 3) $\left(-\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$ 4) $\left(\frac{2}{3}, \frac{1}{3}, \frac{1}{3}\right)$

49. If the direction cosines of two lines are given by $l + m + n = 0$ & $l^2 - 5m^2 + n^2 = 0$ then the angle between them is (2014)

1) $\frac{\pi}{6}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{2}$

50. If A(3, 4, 5), B(4, 6, 3), C(-1, 2, 4) & D(1, 0, 5) are such that the angle between the lines $\overline{DC}$ & $\overline{AB}$ is θ then $\cos\theta =$ (2014)

1) $\frac{2}{9}$ 2) $\frac{4}{9}$ 3) $\frac{5}{9}$ 4) $\frac{7}{9}$

51. A(4, 3, 5), B(0, -2, 2) & C(3, 2, 1) are three points. The coordinates of the point in which the bisector of $\angle BAC$ meets the side $\overline{BC}$ is (2015)

1) $\left(\frac{15}{8},\frac{4}{8},\frac{11}{8}\right)$ 2) $\left(\frac{12}{7},\frac{2}{7},\frac{10}{7}\right)$ 3) $\left(\frac{9}{5},\frac{2}{5},\frac{7}{5}\right)$ 4) $\left(\frac{3}{2},0,\frac{3}{2}\right)$

52. If the angle between the lines whose direction cosines are $(-2/\sqrt{21}, C/\sqrt{21}, 1/\sqrt{21})$ & $(3/\sqrt{54}, 3/\sqrt{54}, 6/\sqrt{54})$ is $\pi / 2$, then the value of C is (2016)

1) 6 2) 4 3) -4 4) 2

53. If a line makes angles α, β, γ & δ with four diagonals of a cube, then the value of $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is (2016AP)

1) $\frac{4}{3}$ 2) $\frac{8}{3}$ 3) $\frac{7}{3}$ 4) $\frac{5}{3}$

54.If the direction cosines of two lines are such that $2l + m + 2n = 0$ & $3l^2 + 5m^2 - 11n^2 = 0$, then the angle between the two lines is (2017AP)

1) $\frac{\pi}{4}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{6}$ 4) $\frac{\pi}{2}$

KEY

1) 1	2) 2	3) 3	4) 3	5) 4	6) 2	7) 3	8) 2	9) 1	10) 1
11) 2	12) 3	13) 4	14) 3	15) 3	16) 1	17) 1	18) 3	19) 4	20) 2
21) 1	22) 3	23) 4	24) 3	25) 4	26) 1	27) 1	28) 1	29) 2	30) 2
31) 4	32) 1	33) 1	34) 3	35) 3	36) 3	37) 2	38) 2	39) 2	40) 3
41) 2	42) 2	43) 3	44) 3	45) 3	46) 1	47) 2	48) 2	49) 1	50) 2
51) 1	52)2	53) 2	54)4						

AIEEE PROBLEMS

1. A line makes the same angle θ, with each of the x and z axis. If the angle β, which it makes with y – axis, is such that $\sin^2\beta = 3\sin^2\theta$, then $\cos^2\theta =$ [2004]
   1) 2/3 2) 2/5 3) 3/5 4) 1/5

2. If a line makes an angle of $\frac{\pi}{4}$ with the positive directions of each of x – axis and y – axis, then the angle that the line makes with positive direction of the z – axis is [2007]
   1) $\frac{\pi}{6}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{2}$

KEY

1) 3 2) 4

Exercise-B

1. If A(4,3,5),B(6,4,3),C(2,-1,4),D(0,1,5) then the projection of AB on CD is
   1)0 2)3/4 3)-4/3 4)-3/4

2. If the line joining the points A(4,1,2),B(5,x,0) is parallel to the line joining the points P(2,1,1),Q(3,3,-1) then x=
   1)1/2 2)3 3)2 4)-3/2

3. If the line joining the points (2,3,-1),(3,5,-3) is perpendicular to the line joining the points (1,2,3),(3,5,x) then x=
   2)23 2)7 3)-3/10 4)-10/3

4. The acute angle between the two lines whose direction ratios are given by l+m-n=0 and $l^2+m^2-n^2=0$ is
   1)0 2)π/6 3)π/4 4)π/3

5. The projection of the join of the points (3,4,2),(5,1,8) on the line whose d.c.'s are (2/7,-3/7,6/7) is
   1)7 2)46/13 3)42/13 4)38/13

6. If A(1,2,3),B(4,5,6) are two points, then the foot of the perpendicular drawn from the point B to the line joining the origin and point A is
   1)(16/7,32/7,48/7) 2)(2,45,7) 3)(5,9,6) 4)(1,2,3)

7. If the d.cs (l,m,n) of two lines are connected by the relations al+bm+cn=0 and fmn+gnl+hlml=0 then the two lines are perpendicular if
   1)f/a+g/b+h/c=0 2)af+bg+ch=- 3) √√af± √bg±√ch=0 4) √f/a+√g/b+√h/c=0

8. I: If OP=21 and d.c.'s of $\overrightarrow{OP}$ are (2/7,6/7,-3/7) then P=(6,18,-9).

II : If P=(3,4,-12) then d.c.'s of $\overrightarrow{OP}$ are (3/13,4/13,-12/13)

1)only I is true 2)only II is true

3)both I and II are true 4) neither I nor II are true

9. If (1,2,-2) are the d.r.'s' of a line then

I : The d.c.'s of the line are (-1/3,-2/3,2/3)

II: The d.c.'s of the line are (1/3,2/3,2/3)

1) only I is true 2) only II is true 3) both Iand II are true 4)neither I nor II are true

10. I: If the projections of a line of length d on the coordinate axes are d_1,d_2,d_3 then $d_1^2+d_2^2+d_3^2=2d^2$.

II: If the projections of a line of length d on the coordinate planes are d_1,d_2,d_3 then $d_1^2+d_2^2+d_3^2=d^2$.

1)only I is true 2) only II is true

3) both I and II are true 4) neither I nor II are true

11. Match the following

d.cs of lines	angle between the lines
I. (1,-2,1),(-1,1,0)	a)$\pi/6$
II. (0,1,2),(4,-2,1)	b)$\pi/3$
III.(1,-1,-2),(2,1,-1)	c)$\pi/2$

1)a,b,c 2)b,a,c 3)b,c,a 4)a,c,b

12. The number of lines which are equally inclined to the coordinate axis is

1)3 2)4 3)5 4)6

13. The dcs. of a line which is equally inclined to the coordinate axes are

1)$1/\sqrt{3}$, $1/\sqrt{3}$, $1/\sqrt{3}$ 2)2/3, 2/3, 2/3

3)1/4, 1/4, 1/4 4)1/5, 1/5, 1/5

14. If the dcs. of the line joining the points P(4,3,5) and Q(1,1,k) are 3/7,2/7,6/7 then k=

1)-1 2)11 3)1 4)-11

15. If the line joining the points (k,2,3),(1,1,2) is parallel to the line joining the points (5,4,-1), (3,2,-3) and k =

1)-2 2)2 3)1 4)-1

16. If l_1,m_1,n_1 and l_2,m_2,n_2 are the dcs of two lines, then $(l_1l_2+m_1m_2+n_1n_2)^2 + (l_1m_2-l_2m_1)^2 + (m_1n_2-m_2n_1)^2 + (n_1l_2-n_2l_1)^2 =$

1)3 2)2 3)1 4)3

17. If the drs. of the two lines are 1,2,1 and 2,1,-1 then the angle between lines is

1)90^0 2)30^0 3)45^0 4)60^0

18. If the drs. of the two lines are (1,1,2) and (√3-1,-√3-1,4) then the angle between the lines is

1)120^0 2)90^0 3)60^0 4)30^0

19. If the drs. of the two lines are (3,4,5)and (6,6,3), then the angle made between the lines is

1) $\cos^{-1}(15/19)$ 2) $\cos^{-1}(15/19\sqrt{2})$ 3) $\cos^{-1}(19/15\sqrt{2})$ 4) $\cos^{-1}(0)$

20. If the drs. of the two lines are (1, 1, 2); (-1, 2, 1) then the dcs. of a line which is perpendicular to both of them are

1)$1/\sqrt{3}, 1/\sqrt{3}, -1/\sqrt{3}$ 2) $-1/\sqrt{3}, -1/\sqrt{3}, 1/\sqrt{3}$

3) $1/\sqrt{3}, -1/\sqrt{3}, 1/\sqrt{3}$ 4) $1/\sqrt{3}, 1/\sqrt{3}, 1/\sqrt{3}$

KEY

1) 3	2) 2	3) 2	4) 4	5) 1	6) 1	7) 1	8) 3	9) 1	10) 4
11) 4	12) 2	13) 1	14) 1	15) 2	16) 3	17) 4	18) 3	19) 3	20) 1

23. PLANES

1. The first degree general equation in x, y, z represents a plane.

2. The equation $ax+by+cz+d=0$ of plane is referred as the general equation of the plane.

3. A surface is called a *plane* if all the points of a straight line joining any two points on the surface lie on it.

4. The equation of a plane which is at a distance of p from the origin and whose normal has the direction cosines (l,m,n) is $lx+my+nz = p$.It is known as normal form.

5. Equation of a plane through the origin is $lx+my+nz=0$.

6. The equation of a plane is of the form $ax+by+cz+d=0$.

7. The equation of the plane $ax+by+cz+d=0$ in the normal form is

   i. $\frac{a}{\sqrt{a^2+b^2+c^2}}x+\frac{b}{\sqrt{a^2+b^2+c^2}}y+\frac{c}{\sqrt{a^2+b^2+c^2}}z=\frac{-d}{\sqrt{a^2+b^2+c^2}}$ if $d \leq 0$.

   ii. $\frac{-a}{\sqrt{a^2+b^2+c^2}}x+\frac{-b}{\sqrt{a^2+b^2+c^2}}y+\frac{-c}{\sqrt{a^2+b^2+c^2}}z=\frac{d}{\sqrt{a^2+b^2+c^2}}$ if $d>0$.

8. The perpendicular distance from the origin to the plane $ax+by+cz+d=0$ is $\frac{|d|}{\sqrt{a^2+b^2+c^2}}$

9. In the plane $ax+by+cz+d=0$, the coefficients a,b,c are the direction ratios of the normal to the plane.

10. The perpendicular distance (length of the perpendicular) from (x_1, y_1, z_1) to the plane $ax+by+cz+d=0$ *is* $\frac{|ax_1+by_1+cz_1+d|}{\sqrt{a^2+b^2+c^2}}$.

11. The equation of a plane passing through (x_1, y_1, z_1) is $a(x-x_1+b(y-y_1)+c(z-z_1)=0$.

12. The equation of a plane passing though the origin is $ax+by+cz+d=0$ where (a,b,c) are the direction ratios of the normal to the plane.

13. The equation of the plane passing through (x_1, y_1, z_1), (x_2, y_2, z_2) (x_3, y_3, z_3) is

$$\begin{vmatrix} x-x_1 & y-y_1 & z-z_1 \\ x_2-x_1 & y_2-y_1 & z_2-z_1 \\ x_3-x_1 & y_2-y_1 & z_3-z_1 \end{vmatrix} = 0.$$

14. If a plane cuts x- axis at A (a,0,0) y- axis at B(0,b,0) and z-axis C(0,0,c) then a is called x –intercept , b is called y –intercept,and ci called z –intercept of the plane.

15. **Intercept form:** The equation of the plane having x –intercept a, y –intercept b, z – intercept c is x/a +y/b +z+c =1.

16. The intercept of the plane $ax+by+cz+d=0$ are $-d/a, -d/b, -d/c$.

17. The angle between the normals to the two planes is called the angle between the planes.

18. If θ is an angle between the planes $a_1x+b_1y+c_1z+d_1=0$ *and* $a_2x+b_2y+c_2z+d_2=0$ then $\cos\theta = \dfrac{a_1a_2+b_1b_2+c_1c_2}{\sqrt{a_1^2+b_1^2+c_1^2}\sqrt{a_2^2+b_2^2+c_2^2}}$

19. The planes $a_1x+b_1y+c_1z+d_1=0$. $a_2x+b_2y+c_2z+d_2=0$ are
    i) parallel ⇔ $a_1 : b_1 : c_1 = a_2 : b_2 : c_2$ ii) perpendicular ⇔ $a_1a_2 + b_1b_2 + c_2c_2 = 0$.

20. The equation of a plane parallel to $ax+by+cz+d=0$ *is* $ax+by+cz+k=0$

21. The equation of plane passing through (x_1, y_1, z_1) and parallel to $ax+by+cz+d=0$ is $a(x-x_1)+b(y-y_1)+c(z-z_1) = 0$.

22. The equation of i) *xy*-plane is z =0 ii) yz- plane is x =0 iii) zx –plane is y =0.

23. The equation of the plane passing through (x_1, y_1, z_1) and parallel to i) *xy*-plane is $z = z_1$
    ii) yz- plane is $x = x_1$ iii) zx –plane is $y = y_1$.

24. The distance between the parallel planes $ax+by+cz+d_1=0$. $ax+by+cz+d_2=0$ is $\left|d_1-d_2\right| \Big/ \sqrt{a^2+b^2+c^2}$

25. The points A, B lie in the same side or opposite side of the plane π =0 according as π_{111}, π_{222} have the same sign or opposite signs.

26. If $\pi_1 = a_1 x + b_1 y + c_1 z + d_1 = 0$ *and* $\pi_2 = a_2x + b_2y + c_2z + d_2 = 0$ are two intersecting planes and if $(\lambda_1, \lambda_2) \neq (0,0)$ then $\lambda_1\pi_1 + \lambda_2 \pi_2 = 0$ represents a plane passing through the line of intersection of $\pi_1 = 0$, $\pi_2 = 0$.

27. Let $\pi \equiv a x + b y + c z + d = 0$ be a plane and (l,m,n) be the direction ratios of a line L. Then

i) L is parallel to π ifff al +bm+cn =0 ii) L is perpendicular to π iff a/l =b/m =c/n.

28. The equation of the planes bisecting the angle containing the origin between the plane

$a_1 x + b_1 y + c_1 z + d_1 = 0, a_2x + b_2y + c_2z + d_2 = 0$ are $\frac{a_1x + b_1y + c_1z + d_1}{\sqrt{a_1^2 + b_1^2 + c_1^2}} \pm \frac{a_2x + b_2y + c_2z + d_2}{\sqrt{a_2^2 + b_2^2 + c_2^2}} = 0$

If $d_1d_2 > 0$ then the plane bisecting the angle containing the origin between the planes is

$\frac{a_1x + b_1y + c_1z + d_1}{\sqrt{a_1^2 + b_1^2 + c_1^2}} - \frac{a_2x + b_2y + c_2z + d_2}{\sqrt{a_2^2 + b_2^2 + c_2^2}} = 0$ and the line bisecting the other angle is

$$\frac{a_1x + b_1y + c_1z + d_1}{\sqrt{a_1^2 + b_1^2 + c_1^2}} + \frac{a_2x + b_2y + c_2z + d_2}{\sqrt{a_2^2 + b_2^2 + c_2^2}} = 0$$

Area of the triangle formed by the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ with

a)x-axis,y-axis is $\frac{1}{2}|ab|$

b)y-axis,z-axis is $\frac{1}{2}|bc|$

c) x-axis,z-axis is $\frac{1}{2}|ca|$

Exercise-A

1. The equation of the plane through (2,-3,4) and parallel to the plane 2x-5y-7z = 6 is

1)2x - 5y -7z =10 2) 2x - 5y – 7z =15 3) 2x -5y +7z =12 4) 2x-5 y – 7z = -9

2. The equation of the plane through (2,2,1) and parallel to the plane 2x+6y+6z = 9 is

1)x +5y +3z =8 2) x+3y +3z =11 3)x+3y +3z =1 0 4)x + 3y +3z = 0

3. The equation of the plane passing through (-1,1,-1),(0,0,1),(-1,-1,1) is
1)x + y + z-1 = 0 2) x - y – z + 1 = 0
3) 2x +2 y -3z + 8 = 0 4) x + y – z + 1 = 0

4. The equation of the plane passing through (1,1,0),(-2,2,1) and (1,2,1) is
1)2x -3y +3z = 5 2) 2x +3y +3z = 5
3) 2x +3y -3z = 5 4) 2x -3y – 3z + 1 = 0

5. The equation of the plane through (0,1,1), (1,1,2) and (-1,2,-2) is
1)x - 2y – z + 3 = 0 2) x +2y – z = 1
3) x -2 y + z + 1= 0 4) x + 2y + z =3

6. The D.C's of perpendicular drawn from (0,0,0) to 2x+3y-z+1 =0 are
1) $\left(\frac{-2}{\sqrt{14}},\frac{-3}{\sqrt{14}},\frac{1}{\sqrt{14}}\right)$ 2) $\left(\frac{2}{\sqrt{14}},\frac{-3}{\sqrt{14}},\frac{1}{\sqrt{14}}\right)$
3) $\left(\frac{2}{7},\frac{3}{7},\frac{-1}{7}\right)$ 4) $\left(\frac{-2}{\sqrt{14}},\frac{-3}{\sqrt{14}},\frac{-1}{\sqrt{14}}\right)$

7. A plane meets the coordinate axes in A,B,C and centroid of ΔABC is (a,b,c). Then the equation of plane is
1) $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$ 2) $\frac{x}{a}-\frac{y}{b}+\frac{z}{c}=1$
3) $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=3$ 4) $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=6$

8. The line joining (1,-5,10) and (2,3,4) is perpendicular to a plane through the point (4,-1,2). then its equation is
1) x +8 y -6z+16 = 0 2) x +8 y +2 z = 0
3) x +8 y -6z -16 = 0 4) x +4 y –6 z +12= 0

9. The number of lines that make equal angles with coordinate axes and p[assign through origin is
1)8 2)4 3)6 4)2

10. If the equation of a given plane is 3x+4y-5z+7 =0, the normal form of its equations is
1) $\frac{3x}{13}+\frac{4y}{13}-\frac{5z}{13}=\frac{-7}{13}$ 2) $\frac{-3x}{13}-\frac{4y}{13}+\frac{5z}{13}=\frac{7}{13}$
3) $\frac{3x}{5\sqrt{2}}+\frac{4y}{5\sqrt{2}}-\frac{5z}{5\sqrt{2}}=\frac{-7}{5\sqrt{2}}$ 4) $\frac{-3x}{5\sqrt{2}}-\frac{4y}{5\sqrt{2}}+\frac{5z}{5\sqrt{2}}=\frac{7}{5\sqrt{2}}$

11. The equation of the plane which makes intercepts –4,5,6 on co-ordinate axes of x,y,z respectively is
1) $\frac{x}{4}+\frac{y}{5}+\frac{z}{6}=1$ 2) $\frac{x}{4}-\frac{y}{5}+\frac{z}{6}=1$

3) $\frac{x}{4}-\frac{y}{5}-\frac{z}{6}+1=0$ 4) $\frac{x}{4}+\frac{y}{5}+\frac{z}{6}+1=0$

12. The x,y,z intercepts of a plne whose equation is 5x+2y-3z =15 are

1) $\left(3,\frac{15}{2},-5\right)$ 2) $\left(5,\frac{15}{2},5\right)$ 3) $(3,15,-5)$ 4) $(3,15,5)$

13. If (2,-3,6) is the foot of the perpendicular from origin on a plane, its equation is

1)2x-3y-6z+23 =0 2) 2x+3y-6z+41 =0
3) 2x-3y + 6z-49 = 0 4) 2x-3y + 6z =15

14. The equation of the plane which is perpendicular to x-axis and passing through (3,-6,9) is

1) x + 6 = 0 2)z = 9 3)x = 3 4) y +6 = 0

15. The equation of the plane which is parallel to y-axis and making intercepts of 3 and 4 units on X and Z-aes respectively is

1) $\frac{x}{3}+\frac{y}{1}+\frac{z}{4}=1$ 2)4x+3z =12 3) 4y+3z = 12 4)4x+3z = 12y

16. The equation of the plane which is parallel t o Zaxis and making intercepts 4 and 5 on X and Y –axes respectively is

1)4x +5y =20 2)5x-4y =20 3)5x+4y =20 4)4x-5y =20

17. The equation of the plane which is parallel to X-axis and making intercepts 3 and 8 on Y and Z- axis respectively is

1)3y +8y =24 2)3y –8z =24 3)8y-3z =24 4)8y +3z =24

18. The perpendicular distance of origin to the plane 2x +3y+6z +5 =0 is

1) 5/7 2)6/7 3)3/7 4)2/7

19. The perpendicular distance of origin to the plane x + y - 5z + 5 = 0

1) 1/ √27 2) 5/√27 3)0 4)1

20. The points P(-1,2,-2), Q(0,1,1),R(1,1,2) and (-1,1,0) are

1) Collinear 2) Coplanar 3) non coplanar 4) form a square

21. The point on X –axis which is equidistant to (2,-1,-4) and (-4,3,10) is

1) (1,0,0) 2)(-8,0,0) 3) $\left(\frac{-26}{3},0,0\right)$ 4) $\left(\frac{-22}{3},0,0\right)$

22. The point on Y –axis which is equidistant to (2,0,6) and (-6,2,4) is

1) (0,1,0) 2) (0,4,0) 3)(0,-6,0) 4)(0,-1,0)

23. The equation of the plane perpendicularly bisecting the segment joining A (7,0,6) and B(3,4,2) is

1)x-y+ z -7 =0 2) x+y-z =3 3) x+y +z = 11 4) x-y –z+1 =0

24. The equation of the plane perpendicularly bisecting the line segment joining the points A (3,4,1) and B(2,-2,5) is
1)x +6y-6z =5 2) 2x+12y-8z+7 =0 3) 2x+12y -12z+11 = 0 4)x + 6y - 6z =11

25. The foot of the perpendicular from (1,2,3) to a plane is (3,4-1) . Then the equation of that plane is
1)x +y+3z =4 2) x+2y+3z-8 =0 3) x +y -3z-10 = 0 4) x +y -2z-9 =0

26. The equation of the plane through (2,3,-4) and (1,-1,3) and parallel to the line whose DR's are (1,-1,2) is
1)x -9y+5z +11 =0 2) x+9y+5z-9 =0
3) x -9y -5z +5 = 0 4) x +9y -5z-49 =0

27. The plane through the points (1,1,1), (1,-1,1) and (-7,-3,-5) is
1. Parallel to X- axis 2. Parallel to Y- axis
3. Parallel to Z- axis 4. not Parallel to any axes

28. If $\lambda x + 4y + 5z = 7$, $4x + 4\lambda y + 10z - 14 = 0$ represent the same plane the value of λ =
1)1 2)2 3)0 4)3

29. The intersection point on the line passing through (-1,-1,-1) with D.r's (2,3,4) and the plane x+2y+3z-14 =0 is
1) (-3,-4,-5) 2)(-1,-2,-3) 3) (3,4,5) 4)(1,2,3)

30. The equation of the plane which contain the points (0,6,0) and (-2,-3,4) and which is parallel to the ray with D.r's (2,3,-2) is
1)3x +2y-6z =1 2) 3x+2y+6z-12 =0
3)3x-2y +6z-12 = 0 4) 3x -2y -6z +12 =0

31. The intersection point of the plane x-y + z = 5 with the line passing through (6,-2,8) and having D.r's (3,4,12) is
1) (3,-6,-4) 2)(2,-1,2) 3) (2,3,6) 4)(1,0,4)

PREVIOUS EAMCET PROBLEMS

32. If the foot of the perpendicular from (0,0,0) to a plane is (1,2,2), then the equation for the plane is (2001)
1)-x++2y+8z –9 =0 2)x+2y+2z-9 =0
3)x+y+z –5 =0 4)x+2y-3z +1 =0

33. A variable plane is at a constant distance p from the origin and meets the axes in A, B and C. The locus of the centroid of the triangle ABC is (2001)
1) $x^{-2} + y^{-2} + z^{-2} = p^{-2}$ 2) $x^{-2} + y^{-2} + z^{-2} = 3p^{-2}$
3) $x^{-2} + y^{-2} + z^{-2} = 9p^{-2}$ 4) $x^{-2} + y^{-2} + z^{-2} = 16p^{-2}$

34. A plane π passes through the point (1,1,1). If b,c,a are the direction ratios of a normal to the plane, where a,b,c(a < b < c)are the prime factors of 2001, then the equation of the plane π is (2002)

1)29x+31y+ 3z = 63 2)23x +29y –29z = 23
3)23x +29+3z = 55 4) 31z +27y +3z = 71

35. If the plane 7x +11y +13z =3003 meets the coordinates axes in A,B,C then the centroid of the triangle ABC is (2002)

1)(143,91,77) 2)(143,77,91) 3)(91,143,77) 4)(143,66,91)

36. In the space the equation by +cz +d = 0 represents a plane perpendicular to the ------ plane.

1)*Y0Z* 2)*Z0X* 3)*X0Y* 4) z = k (2002)

37. The direction ratios of a normal to the plane passing through (0,0,1),(0,1,2) and (1,2,3) are (2002)

1)(0,1,-1) 2)(1,0,-1) 3)(0,0,-1) 4)(1,0,0)

38. If p = (0,1,0), Q = (0,0,1) , then the projection of PQ on the plane x+y+z =3 is

1)2 2)3 3)√2 4) √3 (2002)

39. The image of the point (3, 2, 1) in the plane 2x–y+3x = 7 is : (2009)

1) (1, 2, 3) 2) (2, 3, 1) 3) (3, 2, 1) 4) (2, 1, 3)

40. The image of the line x + y + z – 2= 0 in the Y – axis is : (2010)

1) x – y + = 0 2) y – x + 2 = 0 3) x + y + 2 = 0 4) x + y – 2 = 0

41. A plane meets the coordinate axes at A, B, C so that the centroid of the triangle ABC is (1, 2, 4). Then the equation of the plane is [2010]

1) x +2y +4z = 12 2) 4x + 2y + z = 12
3) x + 2y + 4z = 3 4) 4x + 2y z = 3

42. A plane passes through (2, 3, -1) and is perpendicular to the line having direction ratios 3, -4, 7. The perpendicular distance from the origin to this plane is [2011]

1) $\frac{3}{\sqrt{74}}$ 2) $\frac{5}{\sqrt{74}}$ 3) $\frac{6}{\sqrt{74}}$ 4) $\frac{13}{\sqrt{74}}$

43. If the foot of the perpendicular from (0, 0, 0) to a plane is (1, 2, 3), then the equation of the plane is [2012]

1) 2x + y + 3x = 14 2) x + 2y + 3z = 14
3) x + 2y + 3z + 14 = 0 4) x + 2y – 3z = 14

44. A plane passing through (-1, 2, 3) & whose normal makes equal angles with the coordinate axes is [2013]

1) $x + y + z + 4 = 0$ 2) $x - y + z + 4 = 0$
3) $x + y + z - 4 = 0$ 4) $x + y + z = 0$

45. A plane meets the coordinate axes in P, Q, R respectively. If the centroid of ΔPQR is $\left(1, \frac{1}{2}, \frac{1}{3}\right)$ then the equation of the plane is (2015)
1) $2x + 4y + 3z = 5$ 2) $x + 2y + 3z = 3$
3) $x + 4y + 6z = 5$ 4) $2x - 2y + 6z = 3$

46. The length of perpendicular from the origin to the plane which makes intercepts $\frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ respectively on the coordinates axes is (2015 A.P.)
1) $\frac{1}{5\sqrt{2}}$ 2) $\frac{1}{10}$ 3) $5\sqrt{2}$ 4) 5

47. The image of the points (5, 2, 6) with respect to the palen $x + y + z = 9$ is (2016)
1) (3, -5, 2) 2) (7/2, -1, 5) 3) (7/3, -2/3, 10/3) 4) (7/3, -2/3, =5/3)

48. The image of the points (5, 2, 6) with respect to the plane $x + y + z = 9$ is (2016)
1) (3, -5, 2) 2) (7/2, -1, 5) 3) (7/3, -2/3, 10/3) 4) (7/3, -2/3, =5/3)

49. If the plane $56x + 4y + 9z = 2016$ meets the coordinate axes in A, B, C then the centroid of the triangle ABC is (2016 AP)
1) (12, 168, 224) 2) (12, 168, 112)
3) $\left(12, 168, \frac{224}{3}\right)$ 4) $\left(12, -168, \frac{224}{3}\right)$

50. A point on the plane that passes through the points (1, -1, 6), (0, 0, 7) & perpendicular to the plane $x - 2y + z = 6$ is (2017)
1) (1, -1, 2) 2) (1, 1, 2) 3) (-1, 1, 2) 4) (1, 1, -2)

51. A plane passing through the points (2, 3, 5) & (-3, -5, -7) is perpendicular to the plane $x - y + z = 1$. A point that lies on the plane, among the following is (2017AP)
1) (1, 1, 1) 2) (2, -3, 4) 3) (1, 4, 4) 4) (3, -5, 4)

KEY

1) 4	2) 2	3) 2	4) 3	5) 1	6) 1	7) 3	8) 1	9) 2	10) 4
11) 3	12) 1	13) 2	14) 3	15) 2	16) 3	17) 4	18) 1	19) 2	20) 2
21) 3	22) 2	23) 1	24) 2	25) 4	26) 3	27) 2	28) 2	29) 4	30) 2
31) 4	32) 2	33) 4	34) 3	35) 1	36) 1	37) 1	38) 3	39) 3	40) 1
41) 2	42) 4	43) 2	44) 3	45) 2	46) 1	47)3	48)3	49)3	50)2
51) 3	52)	53)	54)	55)	56)				

AIEEE PROBLEMS

1. The image of the point (-1, 3, 4) in the plane x – 2y = 0 is [2006]
   1) $\left(-\frac{17}{3},-\frac{19}{3},1\right)$ 2) $\left(\frac{9}{5},-\frac{13}{5},4\right)$ 3) $\left(-\frac{17}{3},-\frac{19}{3},4\right)$ 4) $(15,11,4)$

KEY **1) 2**

Exercise-B

1. I: The foot of the perpendicular from (1,3,4) to 2x-y+z+3=0 is (-1,4,3).
   II: The image of (1,3,4) in the plane 2x-y+z+3=0 is (-3,5,2).
   1)only I is true 2)only II is true 3)both are true 4)both are not true

2. If a,b,c are the intercepts of the plane2x+3y+=%5z-30=0 on the coordinate axes respectively then the increasing order of a,b,c is
   1)a,b,c 2)b,c,a 3)c,a,b 4)c,b,a

3. The point which is equidistant from A(3,4,-1) and B(1,-2,5) on y-axis is
   1) (0,1,0) 2) (0,1/3,0) 3)(0,-1/3,0) 4) (0,-5/3,0)

4. The equation to the plane bisecting the line segmen joining (-3,3,2) (9,5,4) & perpendicular to the line segment is
   1) x-y+4z-13=0 2) 2x-2y+7z-23=0
   3) x-7y+2z-1=0 **4) 6x+y+z-25=0**

5. If the equations 2x-ky+5z=7 & kx-8y-10z+14=0 represents the same plane then k^2-k+1=
   1) -4 2) 12 **3) 21** 4) 0

6. If the plane 2x-3y+5z-2=0 divides the line segment joining (1,2,3) & (2,1,k) in the ratio 9:11 then k=
   1) 1 **2)-2** 3) -10 4) -1/2

7. The ratio of the distances (-1,1,3) & (3,2,1) to the plane 2x+5y-7z+9=0 is
   1) 2:1 2) 1:3 3) 1:1 **4) 1:2**

8. The distance between the planes 2x-3y+6z+12=0 & 2x-3y+6z-2=0 is
   1) 10/7 2) 2/7 **3) 2** 4) 24/7
9. If the perpendicular distance from (1,2,4) to the plane 2x+2y-z+k=0 is 3 then k-4=
   1) 0 2) 1 **3) 3** 4) 7
10. Distance between parallel planes 2x-2y+z+3=0 & 4x-4y+2z+5=0 is
   1) 6 **2) 1/6** 3) 3 4) 1/3
11. If the planes 2x+3y-4z+5=0, kx-y+2z+3=0 are perpendicular then k=
) 11/3 **2) 11/2** 3) -11/2 4) 2

KEY

1) **3**	2) **1**	3) **3**	4) **4**	5) **3**	6) **2**	7) **4**	8) **3**	9) **3**	10) **2**
11) **2**									

24. LIMITS AND CONTINUITY

SYNOPSIS

1. $\lim_{x\to a}\frac{x^n-a^n}{x-a}=na^{n-1}$

2. $\lim_{x\to a}\frac{x^m-a^n}{x^n-a^n}=\frac{m}{n}a^{m-n}$

3. $\lim_{x\to 0}\frac{\sin x}{x}=1$

4. $\lim_{x\to 0}\frac{\tan x}{x}=1$

5. $\lim_{x\to 0}\frac{\sin nx}{x}=n$

6. $\lim_{x\to 0}\frac{\tan nx}{x}=n$

7. $\lim_{x\to 0}\frac{e^x-1}{x}=1$

8. $\lim_{x\to 0}\frac{a^x-1}{x}=\log_e a$

9. $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x=e$

10. $\lim_{x\to-\infty}\left(1+\frac{1}{x}\right)^x=e$

11. $\lim_{x\to 0}(1+x)^{1/x}=e$

12. L' Hospital rule: If $\frac{f(x)}{g(x)}$ is of the form $\frac{0}{0}$ or $\frac{\infty}{\infty}$ then $\lim_{x\to a}\frac{f(x)}{g(x)}=\lim_{x\to a}\frac{f'(x)}{g'(x)}$

13. If $f(x)$, $g(x)\in\{x, \sin x, \tan x, \sin^{-1}x, \tan^{-1}x, \sin hx, \tan hx, \sin h^{-1}x, \tan h^{-1}x\}$ then $\lim_{x\to 0}\frac{f(mx)}{g(nx)}=\frac{m}{n}$

14. $\lim_{x\to 0}\frac{f_1(mx)\pm f_2(nx)}{g_1(px)\pm g_2(qx)}=\frac{m\pm m}{p+q}$

15. If $m+n=p+q$ then $\lim_{x\to 0}\frac{f_1^{\,m}(ax)+f_2^{\,n}(bx)}{g_1^{\,p}(cx)g_2^{\,q}(dx)}=\frac{a^m b^n}{c^p d^q}$

16. $\lim_{x\to 0}\frac{1-\cos ax}{g(x)}=0$

17. $\lim_{x\to 0}\frac{1-\cos ax}{g_1(cx)g_2(dx)}=\frac{a^2}{2cd}$

18. $\lim_{x\to 0}\frac{1-\cos^n(ax)}{g_1(x)g_2(dx)}=\frac{na^2}{2cd}$

19. $\lim_{x\to 0}\frac{1-\cos(ax^n)}{g_1(c_1x)g_2(c_2x)\ldots g_{2n}(c_{2n}x)}=\frac{a^2}{2c_1c_2\ldots c_{2n}}$

20. $\lim_{x\to 0}\frac{\cos mx-\cos nx}{\cos ax-\cos bx}=\frac{n^2-m^2}{b^2-a^2}$

21. $\lim_{x\to 0}\frac{\cos ax-\cos bx}{f(cx)g(dx)}=\frac{b^2-a^2}{2cd}$

22. $\lim_{x\to 0}\frac{\cos ax^n-\cos bx^n}{g_1(c_1x)g_2(c_2x)\ldots g_{2n}(c_{2n}x)}=\frac{b^2-a^2}{2c_1c_2\ldots c_{2n}}$

23. $$\lim_{x\to 0}\frac{\tan^n ax-\sin^n ax}{[f(x)]^{n+2}}=\frac{na^{n+2}}{2}$$

24. $$\lim_{x\to 0}\frac{(1+x)^n-1}{x}=n$$

25. $$\lim_{x\to 0}\frac{\sqrt[n]{1+x}-\sqrt[n]{1-x}}{x}=\frac{2}{n}$$

26. $$\lim_{x\to 0}\frac{\sqrt{1+x^n}-\sqrt{1-x^n}}{x^n}=1$$

27. $$\lim_{x\to 0}\frac{\sqrt{a+x}-\sqrt{a-x}}{g(x)}=\frac{1}{\sqrt{a}}$$

28. $$\lim_{x\to 0}\frac{\sqrt{a+x}-\sqrt{a}}{g(x)}=\frac{1}{2}\sqrt{a}$$

29. $$\lim_{x\to 0}\frac{\sqrt{a}-\sqrt{a-x}}{g(x)}=\frac{1}{2}\sqrt{a}$$

30. $$\lim_{x\to\infty}\left(1+\frac{a}{x}\right)^{\frac{1}{x}}=e^a$$

31. $$\lim_{x\to 0}(1+ax)^{1/x}=e^a$$

32. $$\lim_{n\to\infty}\frac{1^k+2^k+\cdots n^k}{n^{k+1}}=\frac{1}{k+1}$$

33. $$\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}=f'(x)$$

34. $\lim\sqrt{a^2-x^2}$ does not exist

35. If $f(x)$, $g(x)$ are polynomials of nth degree then $\lim_{x\to\infty}\frac{f(x)}{g(x)}$
$$=\frac{\text{coefficient of } x^n \text{ in } f(x)}{\text{coefficient of } x^n \text{ in } g(x)}$$

36. If degree of $f(x)$ < degree of $g(x)$ then $\lim_{x\to\infty}\frac{f(x)}{g(x)}=0$.

37. A function is said to be continuous at $x=a$ if $\lim_{x\to a}f(x)=f(a)$.

38. $$\lim_{x\to a}f(x)^{g(x)}=e^{x\to a}\left[f(x)^{-1}\right]g(x)$$
if we get 1^∞ form.

39. $$\lim_{x\to 0}\left(\frac{a^x+b^x}{2}\right)^{\frac{1}{x}}=\sqrt{ab}$$

40. $$\lim_{x\to 0}\frac{(a^x+b^x+c^x)^{1/x}}{3}=\sqrt[3]{abc}$$

41. $$\lim_{x\to 0}\left(\frac{a^x+b^x+c^x+d^x}{4}\right)^{\frac{1}{x}}$$
$$=\sqrt[4]{abcd}$$

Exercise-A

I.

1. $\lim_{x\to 0}\frac{\sin ax}{x} =$

(1) 1 (2) a (3) $\frac{1}{a}$ (4) -1

2. $\lim_{x\to 0}\frac{\sin ax}{\tan bx} =$

(1) a (2) b (3) $\frac{b}{a}$ (4) $\frac{a}{b}$

II.

3. $\lim_{x\to 0}\frac{\sin 7x+\sin 5x}{\tan 5x-\tan 2x} =$

(1) 12 (2) 3 (3) 4 (4) $\frac{3}{4}$

4. $\lim_{x\to 0}\frac{\tan 11x-\sin 7x}{\tanh 5x+\sinh^{-1} x} =$

(1) 2 (2) 3 (3) $\frac{2}{3}$ (4) $\frac{3}{2}$

III.

5. $\lim_{x\to 0}\frac{1-\cos 2x}{x} =$

(1) 1 (2) -1 (3) 0 (4) 2

6. $\lim_{x\to 0}\frac{1-\cos 5x}{\tan 3x} =$

(1) 1 (2) 2 (3) 5 (4) 0

7. $\lim_{x\to 0}\frac{1-\cos 7x}{\sin^{-1} 2x} =$

(1) 1 (2) $\frac{7}{2}$ (3) 0 (4) 2

IV.

8. $\lim_{x\to 0}\frac{1-\cos x}{x\sin 3x} =$

(1) 1 (2) $\frac{1}{6}$ (3) $\frac{1}{3}$ (4) $\frac{2}{3}$

9. $\lim_{x\to 0}\frac{1-\cos 3x}{\sin 5x\tan 2x} =$

(1) $\frac{1}{20}$ (2) $\frac{3}{20}$

(3) $\frac{6}{20}$ (4) $\frac{9}{20}$

V.

10. $\lim_{x\to 0}\frac{1-\cos^3 2x}{\sin 5x\tan 7x} =$

$\left(\lim_{x\to 0}\frac{1-\cos^n(ax)}{g_1(cx)g_2(dx)} = \frac{na^2}{2cd}\right)$

(1) 6 (2) $\frac{6}{35}$

(3) $\frac{35}{6}$ (4) 35

11. $\lim_{x\to 0}\frac{1-\cos^4 3x}{\tan 6x\sin 2x} =$

(1) $\frac{3}{2}$ (2) $\frac{2}{3}$

(3) $-\frac{2}{3}$ (4) $-\frac{3}{2}$

VI.

12. $\lim_{x\to 0}\frac{1-\cos(2x^3)}{x\sin^2(2x)\tan^3(3x)} =$

(1) $\frac{1}{54}$ (2) $\frac{2}{54}$

(3) $\frac{3}{54}$ (4) $\frac{1}{45}$

VII.

13. $\lim\limits_{x\to 0}\dfrac{\cos 3x-\cos 5x}{x^2}=$

(1) 2 (2) 4 (3) 6 (4) 8

14. $\lim\limits_{x\to 0}\dfrac{\cos 2x-\cos 7x}{\sin 3x\cdot\tan 5x}=$

(1) $\dfrac{3}{2}$ (2) $\dfrac{2}{3}$ (3) $\dfrac{7}{5}$ (4) $\dfrac{5}{7}$

15. $\lim\limits_{x\to 0}\dfrac{\cos\frac{x}{2}-\cos\frac{x}{3}}{x^2}=$

(1) -5 (2) $\dfrac{-5}{72}$

(3) $\dfrac{5}{72}$ (4) $\dfrac{72}{5}$

VIII.

16. $\lim\limits_{x\to 0}\dfrac{\cos 3x-\cos 2x}{\cos 5x-\cos 4x}=$

(1) $\dfrac{5}{7}$ (2) $\dfrac{5}{9}$ (3) $\dfrac{9}{5}$ (4) $\dfrac{7}{5}$

17. $\lim\limits_{x\to 0}\dfrac{\cos x-\cos 2x}{\cos 3x-\cos 4x}=$

(1) 3 (2) $\dfrac{3}{7}$ (3) $\dfrac{7}{3}$ (4) 7

IX.

18. $\lim\limits_{x\to 0}\dfrac{\tan x-\sin x}{x^3}=$

$\left(\lim\limits_{x\to 0}\dfrac{\tan^n ax-\sin^n ax}{[g(x)]^{n+2}}=\dfrac{na^{n+2}}{2}\right)$

(1) 1 (2) $\dfrac{1}{2}$ (3) $\dfrac{3}{2}$ (4) $-\dfrac{1}{2}$

19. $\lim\limits_{x\to 0}\dfrac{\tan^2 3x-\sin^2 3x}{x^4}=$

(1) 9 (2) 18 (3) 81 (4) 243

20. $\lim\dfrac{\tan^3 2x-\sin^3 2x}{}=$

(1) 42 (2) 48 (3) 54 (4) 84

X.

21. $\lim\limits_{x\to 0}\dfrac{\sqrt{1+x}-1}{x}=$

(1) 0 (2) 1 (3) 2 (4) $\dfrac{1}{2}$

22. $\lim\limits_{x\to 0}\dfrac{\sqrt[3]{1+x}-1}{x}=$

(1) 0 (2) 3 (3) $\dfrac{1}{3}$ (4) $\dfrac{1}{\sqrt{3}}$

23. $\lim\limits_{x\to 0}\dfrac{(1+x)^5-1}{(1+x)^3-1}=$

(1) $\dfrac{5}{3}$ (2) $\dfrac{3}{5}$

(3) $-\dfrac{3}{5}$ (4) $-\dfrac{5}{3}$

24. $\lim\limits_{x\to 0}\dfrac{(1+x)^{-5/3}-1}{(1+x)^{-4/3}-1}=$

(1) $\dfrac{4}{5}$ (2) $\dfrac{5}{4}$

(3) $-\dfrac{4}{5}$ (4) $-\dfrac{5}{4}$

XI.

25. $\lim\limits_{x\to\infty}\left(1+\dfrac{3}{x}\right)^x=$

(1) e (2) e^2 (3) e^3 (4) $\dfrac{1}{e^{-1}}$

26. $\lim\limits_{x\to\infty}\left(1-\dfrac{2}{x}\right)^x=$

(1) e (2) e^2 (3) e^{-1} (4) e^{-2}

27. $\lim\left(1+\frac{a}{\ }\right)^{bx} =$

(1) e^{a} (2) e^{ab}

(3) $e^{a/b}$ (4) $e^{-a/b}$

28. $\lim_{x\to\infty}\left(\frac{x+3}{x+5}\right)^{x} =$

(1) e (2) e^{2} (3) e^{-2} (4) e^{-1}

29. $\lim_{x\to\infty}\left(\frac{x+2}{x-5}\right)^{x} =$

(1) e^{2} (2) e^{5} (3) e^{7} (4) e^{9}

XII.

30. $\lim_{x\to 0}(1+3x)^{1/x} =$

(1) 1 (2) e (3) e^{2} (4) e^{3}

31. $\lim_{x\to 0}(1-2x)^{3/x} =$

(1) e^{2} (2) e^{6} (3) e^{-2} (4) e^{-6}

XIII.

32. $\lim_{n\to\infty}\frac{1+2+3\cdots+n}{n^{2}} =$

(1) $\frac{1}{2}$ (2) $\frac{3}{2}$ (3) $\frac{1}{4}$ (4) $\frac{3}{4}$

33. $\lim_{n\to\infty}\frac{1^{2}+2^{2}+\cdots+n^{2}}{n^{3}} =$

(1) $\frac{1}{6}$ (2) $\frac{1}{3}$ (3) -1 (4) $\frac{1}{2}$

34. $\lim_{n\to\infty}\frac{\sum n^{7}}{n^{8}} =$

(1) $\frac{1}{2}$ (2) $\frac{1}{4}$ (3) $\frac{1}{6}$ (4) $\frac{1}{8}$

35. $\lim_{x\to\infty}\frac{\sum n^{3}}{n\sum n^{2}} =$

(1) $\frac{3}{2}$ (2) $\frac{3}{4}$ (3) $\frac{2}{3}$ (4) $\frac{4}{3}$

36. $\lim_{n\to\infty}\frac{1+\frac{1}{3}+\frac{1}{3^{2}}+\cdots+\frac{1}{3^{n-1}}}{1+\frac{1}{2}+\frac{1}{3^{2}}+\cdots+\frac{1}{2^{n-1}}} =$

(1) 3 (2) 2 (3)1 (4) $\frac{3}{4}$

XIV.

37. $\lim_{x\to\infty}\frac{5x+3}{7x+11}$

(1) 1 (2) 0 (3) $\frac{5}{7}$ (4) $\frac{3}{7}$

38. $\lim_{x\to\infty}\frac{3x^{2}-7x+11}{2x^{2}+5x+3}$

(1) 3 (2) $\frac{3}{2}$ (3) $\frac{2}{3}$ (4) 2

39. $\lim_{x\to\infty}\frac{5x^{2}+7x+11}{2x-3}$

(1) 1 (2) 0 (3) ∞ (4) $-\infty$

40. $\lim_{x\to\infty}\frac{(2x+3)(5x+7)}{(11x+9)(3x+2)}$

(1) $\frac{21}{18}$ (2) $\frac{18}{21}$

(3) $\frac{10}{33}$ (4) $\frac{33}{10}$

41. $\lim_{x\to\infty}\frac{x}{\sqrt{4x^{2}+1}+x}$

(1) 1 (2) $\frac{1}{2}$ (3) $\frac{1}{3}$ (4) $\frac{1}{4}$

42. $\lim_{x\to\infty}\frac{2x+5}{\sqrt{4x^{2}+1}-2}$

(1) 1 (2) 2 (3) $\frac{1}{2}$ (4) -1

43. $\lim \frac{2x^2+5x+3\sin x}{}$

(1) 2 (2) $\frac{2}{3}$ (3) 3 (4) $\frac{3}{2}$

XVI.

44. $\lim_{x\to 0}\frac{x-\sin x}{x^3}$

(L' Hospital's Rule)

(1) $\frac{1}{3}$ (2) $\frac{1}{2}$ (3) $\frac{1}{6}$ (4) $\frac{1}{4}$

45. $\lim_{x\to 0}\frac{2\sin x-\sin 2x}{x^3}$

(1) 1 (2) 2 (3) –1 (4) 0

46. $\lim_{x\to 0}\frac{2^x-1}{\sqrt{x+1}-1}$

(1) 2log 2 (2) $\frac{1}{\log 2}$

(3) log 4 (4) –log 2

47. $\lim_{x\to 1}\frac{\log x}{x-1}$

(1) 1 (2) 0 (3) –1 (4) 2

48. $\lim_{x\to 1}\frac{\cos\left(\frac{\pi x}{2}\right)}{1-\sqrt{x}}$

(1) π (2) 2π (3) $\frac{\pi}{2}$ (4) $\frac{\pi}{3}$

49. $\lim_{h\to 0}\frac{\sin(x+h)-\sin x}{h}$

(1) $\sin x$ (2) $\cos x$

(3) $-\cos x$ (4) $-\sin x$

50. $\lim_{x\to 0}\frac{(2+x)\sin(2+x)-2\sin 2}{x}$

(1) 2cos 2

(2) 2cos 2 + sin 2

(3) 2sin 2 + cos 2

(4) 2sin 2

51. $\lim_{x\to 0}\frac{a^x-b^x}{d^x-1}=$

($a, b, d > 0$ and $\neq 1$)

(1) $\log_d \frac{a}{b}$ (2) $\log_b \frac{a}{b}$

(3) $\log \frac{a}{b}$ (4) $\log_d \frac{b}{a}$

52. $\lim_{x\to 0}\frac{\sqrt[3]{8+x}-2}{x}=$

(1) $\frac{1}{3}$ (2) $\frac{1}{6}$ (3) $\frac{1}{12}$ (4) 2

53. $\lim_{x\to 0}\frac{\sqrt{1+x}-\sqrt{1+x^2}}{\sqrt{1-x^2}-\sqrt{1-x}}=$

(1) 1 (2) –1 (3) 2 (4) $\frac{1}{2}$

54. $\lim_{x\to 0}\frac{\log(1+ax)-\log(1-bx)}{e^{ax}-e^{-bx}}=$

(1) 1 (2) 2 (3) 3 (4) 4

XVII.

55. $\lim_{x\to\infty}\frac{2^{n+1}+3^{n+2}}{2^{n-1}+3^{n+1}}=$

(1) 3 (2) 33 (3) 2 (4) 4

56. $\lim_{x\to\infty}\frac{5^{n+1}+3^{n-2}}{5^{n-1}+3^{n-1}}=$

(1) 5 (2) 15 (3) 20 (4) 25

57. Lt $\lim_{n\to\infty}\frac{2.3^{n+1}-3.5^{n+1}}{2.3^n+3.5^n}=$

(1) –3 (2) 3 (3) 5 (4) **–5**

XVIII.

58. $\lim_{x\to 0}\frac{\sqrt[5]{1+x}-\sqrt[5]{1-x}}{x}=$

$$\left(\lim_{x\to 0}\frac{\sqrt[n]{1+x}-\sqrt[n]{1-x}}{x}=\frac{2}{n}\right)$$

(1) $\frac{2}{5}$ (2) $\frac{5}{2}$

(3) $-\frac{2}{5}$ (4) $-\frac{5}{2}$

59. $\lim_{x\to 0}\frac{\sqrt[3]{1+x}-\sqrt[3]{1-x}}{x}=$

(1) $\frac{1}{3}$ (2) $\frac{2}{3}$ (3) 1 (4) $\frac{3}{2}$

60. $\lim_{x\to 0}\frac{\sqrt{1+x}-\sqrt{1-x}}{x}=$

(1) 1 (2) 2 (3) 3 (4) 4

XIX.

61. $\lim_{x\to 5^-}[x]-x$

(1) 1 (2) 0 (3) –1 (4) 5

62. $\lim_{x\to 2^+}[x]+x^2+2$

(1) 4 (2) 2 (3) 6 (4) 8

63. $\lim_{x\to 5}|x|-x=$

(1) 1 (2) 0 (3) 2

(4) does not exist

64. $\lim_{x\to 2.5}[x]+x$

(1) 2 (2) 4 (3) 2.5 (4) 4.5

65. $\lim_{x\to 0}\frac{5|x|+3x}{7x-3|x|}=$

(1) 8 (2) 4 (3) 2 (4) 1

66. $\lim_{x\to 0^-}\frac{|x|}{x}+x^2+3x+5=$

(1) –1 (2) 4 (3) 1 (4) 5

67. $\lim_{x\to 2}\sqrt{4-x^2}=$

(1) 1 (2) 2 (3) 0

(4) does not exist

68. $\lim_{x\to 0}\left(\frac{2^x+3^x}{2}\right)^{\frac{1}{x}}=$

(1) 2 (2) $\sqrt{2}$

(3) 6 (4) $\sqrt{6}$

69. $\lim_{x\to 0}\left(\frac{3^x+27^2}{2}\right)^{\frac{1}{x}}=$

(1) 3 (2) 12 (3) 9 (4) 5

70. $\lim_{x\to 0}\left(\frac{2^x+4^x+8^x}{3}\right)^{\frac{1}{x}}=$

(1) 4 (2) 3 (3) 5 (4) 7

71. $\lim_{x\to 0}\left(\frac{3^x+2.9^x+27^x}{4}\right)^{\frac{1}{x}}=$

(1) 2 (2)4 (3)3 (4)9

72. $\lim_{x\to 0}\left(\frac{\sqrt{2^x}+2^x+2\sqrt{2^x}}{3}\right)^{\frac{1}{x}}=$

(1) 2 (2) 3 (3) 4 (d) None

73. $\lim_{x\to 0}\left[\frac{5^x+2(25^x)+125^x}{4}\right]^{\frac{1}{x}}=$

(1) 5 (2) 5^2 (3) 5^3 (4)None

74. $\lim_{x\to\infty}\left(\frac{2^{\frac{1}{x}}+27^{\frac{1}{x}}+8^{\frac{1}{x}}}{3}\right)^{x}=$

(1) $3\sqrt[3]{2}$ (2) $2\sqrt[3]{2}$

(3) $4\sqrt[3]{2}$ (4) $6\sqrt[3]{2}$

75. Lt $\lim_{n\to\infty}\left(\frac{2^n+3^n}{5^n-4^n}\right)^{\frac{1}{n}}=$

(1) 0 (2) $\frac{5}{2}$ (3) $\frac{2}{5}$ (4) $\frac{3}{5}$

76. $\lim_{n\to\infty}\frac{n\left(1^3+2^3+...n^3\right)}{\left(1^2+2^2+....n^2\right)^3}=$

□(1) $\frac{3}{16}$ (b□) $\frac{9}{16}$

(3) 0 (d) $\frac{27}{16}$

77. Find $f(0)$ if $f(x)=\frac{\cos 3x-\cos 4x}{x^2}$ is continuous at $x = 0$.

(1) $\frac{7}{2}$ (2) $\frac{2}{7}$

(3) $-\frac{7}{2}$ (4) $-\frac{2}{7}$

78. Find $f(a)$ if $f(x)=\frac{x^5-a^5}{x-a}$ is continuous at $x = a$.

(1) $5a$ (2) $5a^2$

(3) $5a^3$ (4) $5a^4$

79. Find $f(-2)$ if $f(x)=\frac{x^5+32}{x^3+8}$ f(x) is continuous at $x = -2$.

(1) $\frac{1}{4}$ (2) $\frac{20}{3}$

(3) $\frac{3}{5}$ (4) 4

80. Find a if $f(x)=\frac{\sin^2 ax}{x^2}$ is continuous at $x = 0$ and $f(0) = 1$.

(1) 1 (2) -1 (3) ± 1 (4) 0

81. **A:** $\lim_{x\to 0}\frac{|x|}{x}=1$

R: Limit of a function doesn't exist if left and right limits exists and are not equal.

(a) **A** true, **R** true and **R** is correct explanation of **A**.
(b) **A** true, **R** true but **R** is not correct explanation of **A**.
(c) **A** true, **R** false.
(d) **A** is false but **R** is true.

82. Match the following.

I. $\lim_{x\to\infty}\left(\frac{x+a}{x+b}\right)^{x+b}=$	(a) e
II. $\lim_{x\to\infty}\frac{\left(a^{1/x}+b^{1/x}+c^{1/x}\right)^x}{3}=$	(b) e^{a-b}
III. $\lim_{x\to\infty}\frac{\left(16^x+9^x\right)^{1/x}}{2}=$	(c) 12
IV. $\lim_{x\to 0}(1+\sin)^{\cot x}=$	(d) 0
	(e) $\sqrt[3]{abc}$

(1) c, b, a, d (2) b, e, a, c
(3) b, e, c, a (4) d, c, b, a

83. Match the following.

I. $\lim_{x\to 0}\frac{e^x-e^{-x}}{x}=$	(a) e^{-3}
II. $\lim_{x\to\infty}x\left(e^{1/x}-1\right)=$	(b) 1
III. $\lim_{x\to 0}(1+2x)^{3/x}=$	(c) e^6
IV. $\lim_{x\to 0}(1-3x)^{1/x}=$	(d) 2
	(e) e^{10}

(1) c, b, a, d (2) b, e, a, c
(3) d, b, c, a (4) d, c, b, a

84. Arrange in ascending order.

A) $\lim_{x\to 0}\frac{4^x-1}{x}$

B) $\lim_{x\to 0}\frac{3^x-1}{\sqrt{1+x}-1}$

C) $\lim_{x\to 0}\frac{5^x-1}{x}$

D) $\lim_{x\to 0}\frac{9^x-3^x}{x}$

(1) A, B, C, D (2) D, A, C, B
(3) C, A, D, B (4) D, B, A, C

85. Arrange in ascending order.

A) $\lim_{x\to 2.3}|x|$ B) $\lim_{x\to 1.2} x-|x|$

C) $\lim_{x\to \frac{3}{2}} x+|x|$ D) $\lim_{x\to 5.4} x-|x|$

(1) A, B, C, D (2) B, D, A, C
(3) C, A, D, B (4) D, B, A, C

PREVIOUS EAMCET PAPER'S PROBLEMS

86. If $f(x)=\frac{\sqrt{1+x}-1}{x}$ is not defined at $x = 0$, what should be its value at $x = 0$ so that $f(x)$ becomes continuous function. **(1985)**

(1) 1 (2) 2 (3) $\frac{1}{2}$ (4) none

87. If $f(x)=\frac{3x+4\tan x}{x}$ is continuous at $x = 0$ then the value of the function is **(1991)**

(1) 5 (2) 6 (3) 7 (4) none

88. $\lim_{x\to\infty}\frac{1}{n^3}\left[\frac{1+3+6\cdots+n(n+1)}{2}\right]=$ **(1993)**

(1) $\frac{1}{6}$ (2) $\frac{1}{3}$ (3) 0 (4) 1

89. $\lim_{x\to\infty}\left(\frac{x}{1+x}\right)^x=$ **(1993)**

(1) e (2) $\frac{1}{e}$ (3) ∞ (d) log e

90. $\lim_{x\to 0}\frac{a^x-b^x}{x}=$ **(1993)**

(1) $a-b$ (2) $\log\frac{a}{b}$ (3) $\log\frac{b}{a}$ (4) $\log_b a$

91. If $f(x)=\frac{x^2}{|x|}$, $f(x) = 0$ at $x = 0$ then **(1994)**

(a) $f(x)$ is continuous everywhere
(b) $f(x)$ is discontinuous everywhere
(c) none of the above
(d) $f(x)$ is not discontinuous

92. $\lim_{x\to 0}\frac{e^{\tan x}-e^x}{\tan x-x}=$ **(1994)**

(1) 1 (2) 2 (3) 3 (4) 4

93. $\lim_{x\to 1^+}\frac{|\sqrt{x-1}|+\sqrt{x-1}}{\sqrt{x^2-1}}=$ (1994)

(1) $\sqrt{2}$ (2) $2\sqrt{2}$
(3) $\frac{\sqrt{2}}{2}$ (4) 2

94. $\lim_{x\to 0}\frac{x}{\sqrt{x+4}}-2$ **(1995)**

(1) 4 (2) $\sqrt{2}$
(3) $2\sqrt{2}$ (4) $\frac{1}{\sqrt{2}}$

95. If $f(x)=x^{\frac{1}{x-1}}$ $(x\neq 1)$ and if f is continuous at $x = 1$ then f(1)= **(1996)**

(1) 0 (2) 1 (3) e (4) $\frac{1}{e}$

96. $\lim_{x\to\infty}\frac{|3x^2+1|}{2x^2+1} =$ **(1997)**

(1) $\frac{3}{2}$ (2) $\frac{2}{3}$

(3) $-\frac{3}{2}$ (4) $-\frac{2}{3}$

97. Given that the function f defined by $f(x)$
$= 2x - 1$ if $x > 2$
$= k$ if $x = 2$
$= x^2 - 1$ if $x < 2$
is continuous, then $k =$ **(1997)**
(1) 1 (2) 3 (3) 4 (4) 5

98. If $f(x) = \frac{\sin x}{x}$ is continuous at $x = 0$ then $f(0) =$ **(1998)**
(1) 1 (2) 2 (3) 3 (4) 4

99. If $f : R \to R$ is continuous ∋ $f(x + y) = f(x) + f(y)$, for $x, y \in R$ and $f(1) = 2$ then $f(100) =$ **(1998)**
(1) 100 (2) 200
(3) 300 (4) 400

100. $\lim_{x\to 0}\log\left|\log\frac{1+x}{x}\right| =$ **(1998)**

(1) 0 (2) 1 (3) e (4) $\frac{1}{e}$

101. $\lim_{x\to\infty}\frac{2x+7\sin x}{4x+3\cos x} =$ **(1999)**

(1) 0 (2) –1 (3) $\frac{1}{2}$ (4) $-\frac{1}{2}$

102. If the function $f(x) = \frac{\sin 3x}{x}$ for $x \neq 0$; $\frac{k}{2}$ for $x = 0$ is continuous then $k =$ **(2000)**
(1) 1 (2) 2 (3) 6 (4) 8

103. $\lim_{x\to 0}\frac{\log_e(1+x)}{3^x-1} =$ **(2000)**
(1) $\log_e 3$ (2) $\log_3 e$
(3) log 3 (4) log e

104. $\lim_{\theta\to\frac{\pi}{2}}\frac{1-\sin\theta}{\cos\left(\frac{\pi}{2}-\theta\right)} =$ **(2000)**

(1) 1 (2) 2 (3) $\frac{1}{2}$ (4) 3

105. If $f(x) = \frac{x^2-10x+25}{x^2-7x+10} =$ for $x \neq 5$ and f is continuous at $x = 5$ then $f(5) =$ **(2001)**
(1) 1 (2) 0 (3) 4 (4) 5

106. $\lim_{x\to 0}\frac{x.10^x - x}{1-\cos x} =$ **(2001)**
(1) log 10 (2) log 20
(3) 2 log 10 (4) log 2

107. $\lim_{x\to\infty}\left(\frac{x+a}{x+b}\right)^{x+b} =$ **(2001)**
(1) e^a (2) e^b
(3) e^{ab} (4) e^{a-b}

108. If $f(x) = 2x + b$ $(x < \alpha)$; $x + d$ $(x \geq \alpha)$ is such that $\lim_{x\to\alpha} f(x) = l$ then $l =$ **(2001)**
(1) $2d - b$ (2) $2b - d$
(3) $2d + b$ (4) $b - 2d$

109. If $f : R \to R$ defined by $f(x) = a^2\cos^2 x + b^2\sin^2 x$ $(x \leq 0)$; =

e^{ax+b} $(x > 0)$ is continuous function then **(2002)**

(1) $b = 2\log a$ (2) $2b = \log a$

(3) $b = \log 2a$ (4) $b^2 = \log a$

110. The quadratic equation whose roots are l and m where

$$l = \lim_{\theta \to 0} \frac{3\sin\theta - 4\sin^2\theta}{\theta} \text{ and}$$

$$m = \lim_{\theta \to 0} \frac{2\tan\theta}{\theta\left(\theta - \tan^2\theta\right)} \text{ is}$$

(2002)

(a) $x^2 - 1 = 0$

(b) $x^2 - 5x + 6 = 0$

(c) $x^2 - 3x + 6 = 0$

(d) none

111. $\lim_{x \to 0} \frac{4^x - 9^x}{x\left(4^x + 9^x\right)} =$ **(2002)**

(1) log 2 (2) log 3

(3) log 2 / 3 (4) log 3 / 2

112. If $f(x) = \frac{\sqrt{1+kx} - \sqrt{1-kx}}{x}$ for $-1 \le x < 0$; $f(x) = 2x^2 + 3x - 2$ for $0 < x < 1$ is continuous at $x = 0$ then $k =$ **(2003)**

(1) 4 (2) –3 (3) –2 (4) –1

113. If $a > 0$ $\lim_{x \to a} \frac{a^x - x^a}{x^x - a^a} = -1$ then $a =$ **(2003)**

(1) 1 (2) 2 (3) 3 (4) 4

114. $\lim_{x \to \pi/6} \frac{3\sin x - \sqrt{3}\cos x}{6x - \pi} =$ **(2003)**

(1) $\sqrt{3}$ (2) $\frac{1}{\sqrt{3}}$

(3) $-\sqrt{3}$ (4) $-\frac{1}{\sqrt{3}}$

115. $\lim \frac{1}{\ }\sum^{n} k^2 x =$ **(2004)**

(1) x (2) $\frac{x}{2}$ (3) $\frac{x}{3}$ (4) $\frac{x}{4}$

116. If $f: R \to R$ is defined by

$$f(x) = \begin{cases} \frac{x+2}{x^2+3x+2} & \text{if } x \in R - \{-1,-2\} \\ -1 & \text{if } x = -2 \\ 0 & \text{if } x = -1 \end{cases}$$

then f is continuous on the set: **(2005)**

(1) R (2) R-{–2}

(3) R-{-1} (4) R-{–1, –2}

117. $\lim_{x \to 0} x^2 \sin\frac{\pi}{x} =$ **(2005)**

(1) 1 (2) 0 (3) does not exist

(4) ∞

118. If $f : R \to R$ is defined by

$$f(x) = \begin{cases} \frac{x-2}{x^2-3x_2} & \text{if } x \in R - \{-1, 2\} \\ 2 & \text{if } x = 1 \\ 1 & \text{if } x = 2 \\ 2 & \end{cases}$$

then $\lim_{x \to 2} \frac{f(x) - f(2)}{x - 2} =$ **(2005)**

(1) 0 (2) –1 (3) 1 (4) 1 / 2

119. $\lim_{x \to \infty} \left[\sqrt{x^2 + 2x - 1} - x\right]$ **(2006)**

(1) ∞ (2) $\frac{1}{2}$ (3) 4 (4) 1

120. If $0 < p < q$, then $\lim_{x \to \infty} \left(q^n + p^n\right)^{\frac{1}{n}} =$ (2006

(1) e (2) p (3) q (4) 0

121. If $\lim_{x\to 0}\left(\frac{\cos 4x + a\cos 2x + b}{x^4}\right)$ is finite then the values of a, b are respectively (2006)

(1) 5, –4 (2) –5, –4
(3) –4, 3 (4) 4, 5

122. If $l_1 = \lim_{x\to 2^+} x + |x|$, $l_2 = \lim_{x\to 2}(2x - |x|)$ and $l_3 = \frac{\cos x}{x - \frac{\pi}{2}}$ then **(2006)**

(1) $l_1 < l_2 < l_3$
(2) $l_2 < l_3 < l_1$
(3) $l_3 < l_2 < l_1$
(4) $l_1 < l_3 < l_2$

123. If $f(x) = \frac{1-\sqrt{2}\sin x}{\pi - 4x}$ if $x \neq \frac{\pi}{4}$ $f(x) = a$ if $x = \frac{\pi}{4}$ is continuous at $\frac{\pi}{4}$, then a = **(2006)**

(1) 4 (2) 2 (3) 1 (4) $\frac{1}{4}$

124. $\lim_{x\to 0}\frac{e^x - e^{\sin x}}{2(x - \sin x)}$ **(2007)**

(1) $-\frac{1}{2}$ (2) **2**

(3) 3 (4) $\frac{3}{2}$

125. If $f(x) = x - 5$ for $x \le 1$;
$= 4x^2 - 9$ for $1 < x < 2$
$= 3x + 4$ for $x \ge 2$ then
$f(2^+) - f(2^-) =$ **(2007)**
(1) 0 (2) 2 (3) 3 (4) 4

126. If $f(x) = \frac{\sin(1+[x])}{[x]}$ for $[x] \neq 0$ $f(x) = 0$ for $[x] = 0$ where $[x]$ denotes the greatest integer not exceeding x, then $\lim_{x\to 0^-} f(x) =$ **(2007)**

(1) –1 (2) 0 (3) 1 (4) 2

127. $\lim_{x\to 0}\frac{(1-e^x)\sin x}{x^2 + x^3}$ (2008)

1)-1 2)0 3)1 4)2

128. If f: $R \to R$ is defined by f(x)=[x-3]+$|x-4|$ for x $\in R$ then $\lim_{x\to 3^-} f(x) =$ (2008)

1)-2 2)-1 3)0 4)1

129. If f; $R \to R$ is defined by $f(x) = \frac{\cos 3x - \cos 4x}{x^2}$ for x $\neq 0$
λ for x=0
and if is continuous at x=0 then $\lambda =$ (2008)

1)-2 2)-4 3)-6 4)-8

130. If f (2) = 4 and f′(2)=1 then $\lim_{x\to 2}\frac{xf(2) - 2f(x)}{x-2}$ (2008)

1)-2 2)1 3)2 4)3

131. $\lim_{x\to\infty}\left(\frac{x+5}{x+2}\right)^{x+3} =$ (2009)

1) e 2) e^2 3) e^3 4) e^5

132. If f :R $\to$ R is defined by f(x) =
$$\begin{cases} \frac{2\sin x - \sin 2x}{2x\cos x} & \text{if } (x \neq 0) \\ a & \text{if } (x = 0) \end{cases}$$
then the value of a so that f is continous at 0 is: (2009)

1) 2 2) 1 3) –1 4) 0

133. $\lim_{x\to 0}\frac{\tan x-\sin x}{x^2}=$ (2010)

1) 0 2) 1 3) ½ 4) -1/2

134. If f :R → R defined by f(x) =$\underline{1 + 3x^2 - \cos 2x}$, for $x \neq 0$

$$\begin{cases} x^2 \\ k, \\ \text{for } x = 0 \end{cases}$$

is continuous at x = 0, then k = (2010)

1) 1 2) 5 3) 6 4) 0

135. $\lim_{x\to 8}\frac{\sqrt{1+\sqrt{1+x}}-2}{x-8}=$ [2011]

1) $\frac{3}{2}$ 2) $\frac{1}{4}$ 3) $\frac{1}{24}$ 4) ∞

136. If [x] denotes the greatest integer not exceeding x and if the function f defined by

$$f(x)=\begin{cases}\frac{a+2\cos x}{x^2} & (x<0)\\ b\tan\frac{\pi}{[x+4]} & (x\geq 0)\end{cases}$$ is continuous at x = 0, then the ordered pair (a, b) =

[2011]

1) (-2, 1) 2) (-2, -1) 3) $(-1,\sqrt{3})$ 4) $(-2,-\sqrt{3})$

137. $\lim_{x\to\infty}\left(\frac{x+6}{x+1}\right)^{x+4}=$ [2012]

1) e^4 2) e^6 3) e^5 4) e

138. Let f: R → R be defined by

$$f(x)=\begin{cases}\alpha+\frac{\sin[x]}{x} & \text{If } x>0\\ 2 & \text{If } x=0\\ \beta+\left[\frac{\sin x-x}{x^3}\right] & \text{If } x<0\end{cases}$$

Where [y] denotes the integral part of y. If f is continous at x = 0, then $\beta-\alpha=$

[2012]

1) – 1 2) 1 3) 0 4) 2

139. Let f be a non – zero real valued continuous function satisfying f(x + y) = f(x).f(y) for all $x, y \in R$ If f(2) = 9, then f(6) = [2013]

1) 3^2 2) 3^6 3) 3^4 4) 3^3

140. $\lim_{x\to 0}\frac{\tan^3 x-\sin^3 x}{x^5}=$ [2013]

1) $\frac{5}{2}$ 2) $\frac{3}{2}$ 3) $\frac{3}{5}$ 4) $\frac{2}{5}$

141. $\lim_{x\to 0}\frac{\sqrt{1+x^2}-\sqrt{1-x+x^2}}{3^x-1}$ (2014)

1) log9 2) $\frac{1}{\log 9}$ 3) log3 4) $\frac{1}{\log 3}$

142. If f: [-2, 2] → R is defined by $f(x)=\begin{cases}\frac{\sqrt{1+cx}-\sqrt{1-cx}}{x} & for -2\le x<0\\ \frac{x+3}{x-1} & for\ 0\le x\le 2\end{cases}$ is continuous on [-2, 2], then c = (2014)

1) 3 2) 3/2 3) $\frac{3}{\sqrt{2}}$ 4) $\frac{2}{\sqrt{3}}$

143. If f(x) = $x\tan^{-1}x$ then $\lim_{x\to 1}\frac{f(x)-f(1)}{x-1}=$ (2014)

1) $\frac{\pi}{4}$ 2) $\frac{\pi+1}{4}$ 3) $\frac{\pi+2}{4}$ 4) $\frac{\pi+3}{4}$

144. $\lim_{x\to 0}\left[\tan\left(x+\frac{\pi}{4}\right)\right]^{1/x}=$ (2015)

1) e^2 2) e 3) $e^{3/2}$ 4) e^{-1}

145. The value that should be assigned to f(0) so that the function f(x) = $(x+1)^{\cot x}$ is continuous at x = 0 is (2015)

1) e 2) 1 3) 2 4) e^{-1}

146. If $\lim_{x\to 2^+}\frac{g(x)-g(2)}{x-2}=$ (2015 A.P.)

1) -1 2) 0 3) 1/2 4) 1

147. $\lim_{\pi}\left(\frac{2x-\pi}{\cos x}\right)=$ (2015 A.P.)

1) 0 2) 1/2 3) -2 4) 5

148. $\lim_{x\to\infty}\left[\frac{x^2+x+3}{x^2-x+2}\right]^x=$ (2016)

1) ∞ 2) e 3) e^4 4) e^2

149. The value of p & q so that the function (2016)

$$f(x)=\begin{cases}\left(1+|\sin x|\right)^{\frac{p}{\sin x}} & ,\frac{-\pi}{6}<x<0\\ q & ,x=0\\ e^{\frac{\sin 2x}{\sin 3x}} & ,0<x<\frac{\pi}{6}\end{cases}$$ is continuous at x = 0 is

1) $p=\frac{1}{3},q=e^{2/3}$ 2) $p=0,q=e^{2/3}$

3) $p=\frac{2}{3},q=e^{-2/3}$ 4) $p=-\frac{2}{3},q=e^{2/3}$

150. The value(s) of x for which the function $f(x)=\begin{cases}1-x & x<1\\ (1-x)(2-x) & 1\le x\le 2\\ 3-x & x>2\end{cases}$ fails to be continuous is (are) (2016AP)

1) 1 2) 2 3) 3 4) All real numbers

151. $\underset{x\to 0}{lt}\frac{6^x-3^x-2^x+1}{x^2}=$ (2016AP)

1) $(\log_e 2)\log_e 3$ 2) $\log_e 5$ 3) $\log_e 6$ 4) 0

152. $\lim_{x\to 1}\left(\frac{1}{y^2-1}-\frac{2}{y^4-1}\right)=$ (2017)

1) $\frac{1}{2}$ 2) $\frac{1}{3}$ 3) $\frac{1}{4}$ 4) 0

153. If $f(x)=\begin{cases}\sin x & if\ x\le 0\\ x^2+a^2 & if\ 0<x<1\\ bx+2 & if\ 1\le x\le 2\\ 0 & if\ x>2\end{cases}$ is continuous on R, then a + b + ab = (2017)

1) -2 2) 0 3) 2 4) -1

154. If $\lim_{x\to 0}\frac{e^{2x}-1}{5x}=1, \lim_{x\to 1}\frac{2}{x-1}\log x = m$, then a cubic equation whose roots are $5l$, m & 1, is (2017AP)

1) $x^3 - 3x^2 + 2 = 0$ 2) $x^3 + 5x^2 - 8x + 2 = 0$
3) $x^3 - 5x^2 + 8x - 4 = 0$ 4) $x^3 + 3x^2 - 4 = 0$

155. Define $f(x)=\begin{cases}\frac{1-\sin x}{(\pi-2x)^2}, & if\ x\neq\frac{\pi}{2}\\ k, & if\ x=\frac{\pi}{2}\end{cases}$ If f(x) is continuous at $x=\frac{\pi}{2}$ then k = (2017AP)

1) $-\frac{1}{8}$ 2) $\frac{1}{8}$ 3) $\frac{\pi}{8}$ 4) $\frac{\pi}{2}$

KEY

1) 2	2) 4	3) 3	4) 3	5) 3	6) 4	7) 3	8) 2	9) 4	10) 2
11) 1	12) 1	13) 4	14) 1	15) 2	16) 2	17) 2	18) 2	19) 3	20) 2
21) 4	22) 3	23) 1	24) 2	25) 3	26) 4	27) 2	28) 3	29) 3	30) 4
31) 4	32) 1	33) 2	34) 4	35) 2	36) 4	37) 3	38) 2	39) 3	40) 3
41) 3	42) 1	43) 2	44) 3	45) 1	46) 1	47) 1	48) 1	49) 2	50) 2
51) 1	52) 3	53) 1	54) 1	55) 1	56) 4	57) 4	58) 1	59) 2	60) 1
61) 3	62) 4	63) 2	64) 4	65) 3	66) 2	67) 4	68) 4	69) 3	70) 1
71) 9	72) 1	73) 2	74) 4	75) 1	76) 3	77) 1	78) 4	79) 2	80) 3
81) 4	82) 3	83) 3	84) 2	85) 2	86) 3	87) 3	88) 1	89) 2	90) 2
91) 1	92) 1	93) 1	94) 1	95) 3	96) 1	97) 2	98) 1	99) 2	100) 1
101) 3	102) 3	103) 2	104) 3	105) 2	106) 3	107) 4	108) 2	109) 1	110) 2
111) 3	112) 3	113) 1	114) 2	115) 3	116) 3	117) 2	118) 2	119) 4	120) 2
121) 3	122) 3	123) 4	124) 2	125) 3	126) 2	127) 1	128) 3	129) 2	130) 3
131)	132)	133)	134)	135)	136)	137)	138)	139)	140)
141) 3	142) 4	143) 1	144) 2	145) 3	146) 2	147) 3	148) 2	149) 2	150) 2
151) 2	152) 3	153) 3	154) 1	155) 1	156) 1	157) 2	148)4	149)4	150)
151) 1	152) 1	153) 4	154) 3	155) 2	156)	157)			

Exercise-B

1. The value of $\lim_{x\to 0}\frac{\sqrt{x^2+1}-1}{\sqrt{x^2+9}-3}=$

1) 3 2) 4 3) 1 4) 2

2. The value of $\lim_{x\to 2a}\frac{\sqrt{x-2a}+\sqrt{x}-\sqrt{2a}}{\sqrt{x^2-4a^2}}=$

1) $\frac{1}{\sqrt{a}}$ 2) $\frac{1}{2\sqrt{a}}$ 3) $\frac{\sqrt{a}}{2}$ 4) $2\sqrt{a}$

3. The value of $\lim_{x\to 2}\frac{2^x+2^{3-x}-6}{\sqrt{2^{-x}-2^{1-x}}}=$

1) 16 2) 8 3) 4 4) 2

4. The value of $\lim_{x\to 0}\frac{\int_0^{x^2}\cos t^2 dt}{x\sin x}=$

1) 3/2 2) 1 3) – 1 4) None of these

5. $\lim_{x\to 0}\left(\frac{1-\cos 5x}{1-\cos 8x}\right)=$

1) 25/64 2) 5/8 3) 64/25 4) 15/23

6. $\lim_{x\to e}\frac{\log x-1}{x-e}=$

1) 1 2) 1/2 3) 1/e 4) 0

7. $\lim_{x\to 1}(1-x)\tan\left(\frac{\pi x}{2}\right)=$

1) $\frac{\pi}{2}$ 2) $\pi+2$ 3) $\frac{2}{\pi}$ 4) 0

8. $\lim_{x\to 0}\frac{\sin x+\log(1-x)}{x^2}=$

1) 0 2) 1/2 3) -1/2 4) Limit does not exist

9. The value of $\lim_{x\to 0}\frac{(1+x)^{1/x}-e}{x}=$

1) 1 2) $\frac{e}{2}$ 3) $-\frac{e}{2}$ 4) $\frac{2}{e}$

10. If f(9) = 9, $f'(9)$=4, then $\lim_{x\to 9}\frac{\sqrt{f(x)}-3}{\sqrt{x}-3}=$

1) 4 2) Zero 3) 2 4) 9

11. $\lim_{x\to 0}\frac{\tan(x^g)}{x}$ (g = grades)

1) $\frac{\pi}{180}$ 2) $\frac{\pi}{90}$ 3) $\frac{\pi}{100}$ 4) $\frac{\pi}{200}$

12. $\lim_{x\to 0} \dfrac{\sin x - x + \frac{x^3}{6}}{x^5} =$

1) $\dfrac{1}{120}$ 2) $\dfrac{-1}{120}$ 3) 0 4) $\dfrac{1}{2}$

13. If α, β are the roots of $ax^2+bx+c=0$ then $\lim_{x\to\alpha} \dfrac{1-\cos\left(ax^2+bx+c\right)}{(x-\alpha)^2} =$

1) 0 2) $\dfrac{1}{2}(\alpha-\beta)^2$ 3) $\dfrac{a^2}{2}(\alpha-\beta)^2$ 4) $\dfrac{-a^2}{2}(\alpha-\beta)^2$

14. $\lim_{x\to 0} \dfrac{x\left(1-\sqrt{1-x^2}\right)}{\sqrt{1-x^2}.\sin^{-1}\left(x^3\right)} =$

1) 1 2) 1/2 3) -1/2 4) -1

15. $\lim_{x\to 1} \dfrac{ax^2+bx+c}{x-1} = 0$, then

1) a = b = c 2) a = c = -b/2 3) 2a = 2c = b 4) a = 2b = c

16. If $f(x) = x^2$, $\phi(a) = b^2$, $f^1(a) = n\ \phi'(a)$ & $\phi'(a) \neq 0$ then $\lim_{x\to a}\left(\dfrac{\sqrt{f(x)}-a}{\sqrt{\phi(x)}-b}\right) =$

1) $\dfrac{na}{b}$ 2) $\dfrac{nb}{a}$ 3) $n(a-b)$ 4) na

17. If f(a) = 2, $f'(a)$=1, g(a) = -1, $g'(a)$=2 then $\lim_{x\to a} \dfrac{g(x).f(a)-g(a)f(x)}{x-a} =$

1) 1/5 2) 5 3) -1/5 4) -5

18. $\lim_{x\to 1} \dfrac{x+x^2+x^3+\ldots\ldots\ldots\ldots\ldots\ldots+x^n-n}{x-1} =$

1) $\dfrac{n(n+1)}{2}$ 2) $\dfrac{n+1}{2}$ 3) $\dfrac{2}{n}$ 4) n

19. $\lim_{x\to 0} \dfrac{\sin^{-1}x - \tan^{-1}x}{x^3} =$

1) 1/2 2) -1/2 3) 1/3 4) -1/3

KEY

1) 1	2) 2	3) 2	4) 2	5) 1	6) 3	7) 3	8) 3	9) 3	10) 4
11) 4	12) 1	13) 3	14) 2	15) 2	16) 2	17) 2	18) 1	19) 1	

AIEEE PROBLEMS

1. $\underset{x \to \pi/2}{Lt} \dfrac{[1-\tan(x/2)][1-\sin x]}{[1+\tan(x/2)][x/2][\pi-2x]^3} =$ [2003]

1) 1/8 2) 0 3) 1/32 4) ∞

2. $\underset{y \to x}{Lt} \dfrac{\sin^2 y - \sin^2 x}{y-x} =$ [2002]

1) $\sin 2y$ 2) $\sin 2x$ 3) $\cos^2 y$ 4) $\cos^2 x$

3. Let α and β be the distinct roots of $ax^3+bx+c = 0$, then $\underset{x \to \alpha}{Lt} \dfrac{1-\cos(ax^2+bx+c)}{(x-\alpha)^2} =$ [2005]

1) $\dfrac{a^2}{2}(\alpha-\beta)^2$ 2) 0 3) $-\dfrac{a^2}{2}(\alpha-\beta)^2$ 4) $\dfrac{1}{2}(\alpha-\beta)^2$

4. If $\underset{x \to 0}{Lt} \dfrac{\log(3+x)-\log(3-x)}{x} = k$ then $k =$ [2003]

1) 0 2) –1/3 3) 2/3 4) –2/3

5. If $\underset{x \to \infty}{Lt} \left(1+\dfrac{a}{x}+\dfrac{b}{x^2}\right)^{2x} = e^2$, then the values of a and b, are [2004]

1) $a \in R, b \in R$ 2) $a = 1$ and $b = 2$ 3) $a \in R, b = 2$ 4) $a=1, b \in R$

KEY

1) 3	2) 2	3) 1	4) 3	5) 4

Exercise-C

1. $\lim\limits_{x \to 0} \dfrac{\sin^3 2x \tan^2 3x}{x \sin^4 4x} =$

(1) 9 (2) $\dfrac{9}{32}$

(3) $\dfrac{32}{9}$ (4) 32

2. $\lim\limits_{x \to 0} \dfrac{\sin^2 ax \tan^3 bx}{\sin^{-1} 2x \tanh^4 cx} =$

(1) $\dfrac{a^2b^2}{2}$ (2) $\dfrac{a^2b^3}{2c^4}$

(3) $a^2 b^3$ (4) $\dfrac{2c^4}{a^2b^3}$

3. $\lim\limits_{x \to 0} \dfrac{\cos mx - \cos nx}{\sin^2 px} =$

(1) $\dfrac{n^2-m^2}{2p}$ (2) $\dfrac{n^2-m^2}{2p^2}$

(3) $\dfrac{n^2+m^2}{2p^2}$ (4) $\dfrac{2p^2}{n^2-m^2}$

4. $\lim\limits_{x \to 0} \dfrac{\cos 3x - \cos x}{\sin^2 5x} =$

(1) $\frac{4}{25}$ (2) $-\frac{4}{25}$

(3) $\frac{25}{4}$ (4) $-\frac{25}{4}$

5. $\lim_{x\to 0}\frac{1-\cos(5x^2)}{x^2\sin 3x\tan 7x}=$

(1)25 (2) $\frac{25}{42}$

(3) $\frac{42}{25}$ (4) 42

6. $\lim_{x\to 0}\frac{\cos 3x-\cos 2x}{\sin^2 5x}=$

(1) -1 (2) $-\frac{1}{5}$

(3) $-\frac{1}{10}$ (4) -10

7. $\lim_{x\to 0}\frac{\cos 3x-\cos 4x}{x^2}=$

(1) $-\frac{7}{2}$ (2) $-\frac{2}{7}$

(3) $\frac{2}{7}$ (4) $\frac{7}{2}$

8. $\lim_{x\to 0}\frac{\cos 2x^3-\cos 5x^3}{x\sin^2 2x\tan^3 3x}=$

(1) $\frac{7}{27}$ (2) $\frac{7}{72}$

(3) $-\frac{7}{72}$ (4) $\frac{72}{7}$

9. $\lim_{x\to 0}\frac{\cos 5x^2-\cos 7x^2}{x^2\sin 3x\tan 7x}=$

(1) $-\frac{4}{5}$ (2) $\frac{4}{7}$

(3) $\frac{7}{4}$ (4) $-\frac{7}{4}$

10. $\lim_{x\to 0}\frac{\sqrt[3]{1+x}-\sqrt[3]{1-x}}{\sqrt{1+x}-\sqrt{1-x}}=$

(1) $\frac{2}{3}$ (2) $\frac{3}{2}$

(3) $-\frac{2}{3}$ (4) $-\frac{3}{2}$

11. $\lim_{x\to 0}\frac{\sqrt[5]{1+x}-\sqrt[5]{1-x}}{\sqrt[4]{1+x}-\sqrt[4]{1-x}}=$

(1) $\frac{2}{3}$ (2) $\frac{4}{5}$ **(3)** $\frac{5}{4}$ (4) $\frac{3}{2}$

12. $\lim_{x\to 0}\frac{\sqrt{1+x^n}-\sqrt{1-x^n}}{x^n}=$

(1) 1 (2) 2 (3) 3 (4) 4

13. $\lim_{x\to 0}\frac{\sqrt{3+x}-\sqrt{3-x}}{\sin x}=$

$\left(\lim_{x\to 0}\frac{\sqrt{a+x}-\sqrt{a-x}}{g(x)}=\frac{1}{\sqrt{a}}\right)$

(1) 1 (2) $\frac{1}{\sqrt{2}}$

(3) $\frac{1}{\sqrt{3}}$ (4) $\sqrt{3}$

14. $\lim_{x\to 0}\frac{\sqrt{2+x}-\sqrt{2-x}}{\tan x}=$

(1) 1 (2) $\frac{1}{2}$

(3) $\frac{1}{\sqrt{2}}$ (4) $\sqrt{2}$

15. $\lim_{x\to 0}\frac{\sqrt{5+x}-\sqrt{5-x}}{x}=$

(1) 1 (2) $\frac{1}{5}$

(3) $\frac{1}{\sqrt{5}}$ (4) $\frac{2}{\sqrt{5}}$

XV.

16. $\lim_{x\to 0}\frac{\sqrt{2+x}-\sqrt{2}}{x}=$

$$\left(\lim_{x\to 0}\frac{\sqrt{a+x}-\sqrt{a}}{g(x)}=\frac{1}{2\sqrt{a}}\right)$$

$$\left(\lim_{x\to 0}\frac{\sqrt{a}-\sqrt{a-x}}{g(x)}=\frac{1}{2\sqrt{a}}\right)$$

(1) $\frac{1}{2}$ (2) 1

(3) $\frac{1}{2\sqrt{2}}$ (4) $2\sqrt{2}$

17. $\lim_{x\to 0}\frac{\sqrt{3+x}-\sqrt{3}}{\sin x}=$

(1) 1 (2) $\frac{1}{\sqrt{3}}$

(3) $\frac{1}{2\sqrt{3}}$ (d) $2\sqrt{3}$

18. $\lim_{x\to 0}\frac{\sqrt{5}-\sqrt{5-x}}{\tan x}=$

(1) 1 (2) $\frac{1}{5}$

(3) $\frac{1}{\sqrt{5}}$ (4) $\frac{1}{2\sqrt{5}}$

19. $\lim_{n\to\infty}\frac{\sum n^3}{n^4}=$

(1) $\frac{1}{2}$ (2) 2 (3) $\frac{1}{4}$ (4) 4

20. $\lim_{n\to\infty}\frac{1^{10}+2^{10}+\cdots n^{10}}{n^{11}}=$

(1) 1 (2) $\frac{1}{10}$

(3) $\frac{1}{11}$ (4) $\frac{11}{10}$

21. $\lim_{x\to 0}\frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{x^2}=$

$$\left(\lim_{x\to 0}\frac{\sqrt{1+x^n}-\sqrt{1-x^n}}{x^n}=1\right)$$

(1) 2 (2) 1 (3) -1 (4) 0

22. $\lim_{x\to 0}\frac{\sqrt{1+x^3}-\sqrt{1-x^3}}{x^3}=$

(1) 0 (2) 3 (3) ∞ (4) $-\infty$

23. $\lim_{x\to 1}(1-x)\tan\frac{\pi x}{2}=$

(1) π (2) $\frac{\pi}{2}$ (3) 2π (4) $\frac{2}{\pi}$

24. $\lim_{x\to 0}\frac{e^x-e^{-x}}{x}=$

(1) 1 (2) -1 (3)2 (4) $-\frac{1}{2}$

25. $\lim_{x\to 0}\frac{e^x-e^{-x}-2x}{x^2}=$

(1) 1 (2) 2 (3) 3 (4) 0

26. $\lim_{x\to\frac{\pi}{4}}\frac{\sin x-\cos x}{x-\frac{\pi}{4}}=$

(1) 1 (2) 2

(3) $\sqrt{2}$ (4) $\frac{1}{\sqrt{2}}$

27. $\lim_{x\to\pi/4}\frac{1-\tan x}{\sin x-\cos x}=$

(1) 1 (2) $\sqrt{2}$

(3) $\frac{1}{2}$ (4) $-\sqrt{2}$

28. $\lim_{x\to 0}\frac{5^x+3^x-2^{x+1}}{x}=$

(1) 5 (2) 1

(3) log 20 (4) $\log\frac{15}{4}$

29. $\lim_{x\to 0}\frac{\log(x+h)-\log x}{h}=$

(1) x (2) $\frac{1}{x}$

(3) $-\frac{1}{x}$ (4) x^2

30. $\lim_{x\to 0}\frac{\frac{1}{\sqrt{x+h}}-\frac{1}{\sqrt{x}}}{h}=$

(1) $-\frac{1}{2}$ (2) $-\frac{1}{2x^2}$

(3) $-\frac{1}{2x^{3/2}}$ 4) -1

31. $\lim_{x\to \pi/2}\frac{1-\sin x}{(\pi-2x)^2}=$

(1) $\frac{1}{2}$ (2) $\frac{1}{4}$ (3) $\frac{1}{6}$ (4) $\frac{1}{8}$

32. $\lim_{x\to 1}\frac{(2x-3)\sqrt{x-1}}{2x^2+x-3}=$

(1) $\frac{1}{10}$ (2) 1

(3) $-\frac{1}{10}$ (4) -10

33. $\lim_{x\to \pi/2}\frac{\cos^2 x}{1-\sin^3 x}=$

(1) $\frac{2}{3}$ (2) $\frac{3}{2}$

(3) $-\frac{2}{3}$ (4) $-\frac{3}{2}$

34. $\lim_{x\to 1}\frac{\sqrt{x+4}-\sqrt{5}}{x-1}=$

(1) 1 (2) $\frac{1}{\sqrt{5}}$

(3) $\frac{1}{2\sqrt{5}}$ (4) $2\sqrt{5}$

35. $\lim_{x\to 1}\frac{x}{x-1}-\frac{1}{\log x}=$

(1) 1 (2) $\frac{1}{2}$ (3) 2 (4) $-\frac{1}{2}$

36. $\lim\frac{\cot x-\frac{1}{x}}{}=$

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$

(3) $-\frac{1}{2}$ (4) $-\frac{1}{3}$

37. $\lim_{x\to 2^+}\frac{[x]}{x}=$

(1) 2 (2) $\frac{1}{2}$ (3) 1 (4) $\frac{1}{4}$

38. $\lim_{x\to 2^-}\frac{[x]}{x}+1=$

(1) $\frac{1}{2}$ (2) 1 (3) $\frac{2}{3}$ (4) $\frac{3}{2}$

39. $\lim_{x\to 0}\frac{(1+x)^{-5/3}-1}{x}=$

(1) $\frac{5}{3}$ (2) $\frac{3}{5}$

(3) $-\frac{5}{3}$ (4) $-\frac{3}{5}$

40. $\lim_{x\to 1}\frac{\sqrt{x}-x^2}{x-1}=$

(1) $\frac{3}{2}$ (2) $\frac{2}{3}$

(3) $-\frac{3}{2}$ (4) $-\frac{2}{3}$

41. $\lim_{x\to 3}\frac{x^3-6x-9}{x^4-81}=$

(1) $\frac{7}{35}$ (2) $\frac{7}{36}$

(3) $\frac{35}{7}$ (4) $\frac{36}{7}$

42. $\lim_{x\to 3}[x]=$

(1) 1 (2) 2 (3) 3

(4) does not exist

43. If $\lim_{x\to 0}\left(\frac{a\cos x + b\sin x - 5}{x^4}\right)$ is finite then a=

1)5/2 2)5 3)2/5 4)1/5

44. Lt $\frac{e^{x^2} - \cos x}{x^2}$ =
$x\to 0$

1)1 2)2 3)3/2 4)2/3

45. Lt $\frac{x-\cos(\sin^{-1}x)}{1-\tan(\sin^{-1}x)}$ = ____
$x\to 1/\sqrt{2}$

1)1/2 2)2/3 3)-1/√2 4)1/√2

46. Lt $\frac{2x-2}{\sqrt[3]{26+x}-3}$ = __
$x\to 1$

1)54 2)3/2 3)1/9 4)3/9

47. If f(x)= $\frac{1}{\sqrt{18-x^2}}$ then $\underset{x\to 0}{lt}\frac{f(x)-f(3)}{x-3}$ =

1)1/2 2)3/2 3)1/9 4)3/9

48. If f(x)=x^2,ϕ(a)=b^2,f′ (a)=xϕ′(a) and ϕ′(a)≠0 then $\underset{x\to a}{lt}\frac{\sqrt{f(x)}-a}{\sqrt{\phi(x)}-b}$ =

1)nb/a 2)na/b 3)nc/a 4)0

49. Lt $\frac{\sqrt{1+\sqrt{2+x}}-\sqrt{3}}{x-2}$ =
$x\to 2$

1)1/8√3 2)1/4 3)1/√2 4)1/√3

50. Lt $\frac{\sin x - x}{x^3}$ = _____
$x\to 0$

1)1/26 2)1/5 3)1/5 4)1/6

51. Lt $\left(\frac{\tan x}{x}\right)^{\frac{1}{x^2}}$ = _____
$x\to 0$

1)$e^{1/4}$ 2)$e^{1/3}$ 3)$e^{1/2}$ 4)$e^{1/5}$

52. $\underset{x \to 1}{lt} \dfrac{x^2 - 1}{\sqrt{3x+1} - \sqrt{5x-1}} =$

1)-4 2)-2 3)2 4)4

53. Domain of function f(x)= $x+2(x+5)^{-0.5} + (x+4)^{0.5} + 4(x+4)^{-0.5}$ is

1) (-4,0) 2)(0,∞) 3)(-4,∞) 4)(-4,0)U(0,∞)

54. Range of the function f(x)= $\dfrac{1}{x^2 - 2x + 3}$

1)[0,1/2] 2)[-1/2,0] 3)[-1/2,1/2] 4)(0,∞)

55. $\underset{x\to\infty}{\text{Lt}} \left(1 + \tan^2 x\right)^{\frac{1}{2x^2}} =$

1)$e^{1/2}$ 2)e 3)$e^{-1/2}$ 4)1

56. $\underset{x\to 0}{\text{Lt}} \dfrac{1}{x} \cos^{-1}[1-x^2/1+x^2] =$

1)0 2)1 3)2 4) Does not exist

57. $\underset{x\to 0}{\text{Lt}} \dfrac{\sqrt{1-x+x^2} - \sqrt{1+x^2}}{4^x-1} =$

1)-log16 2)-1/log16 3)log16 4)1/log16

58. $\underset{x\to\infty}{\text{Lt}} \dfrac{[2x+3]}{x} =$

1)3 2)1/2 3)2 4)1/3

59. $\underset{x\to 1}{\text{Lt}} \dfrac{x^2-1}{|x-1|} =$

1)0 2)-2 3)2 4)Does not exist

60. $\underset{n \to \infty}{lt} \dfrac{1^2+1}{n^3} + \dfrac{2^2+2}{n^3} + --- + \dfrac{n^2+n}{n^3} =$

1)1/6 2)1/4 3)1/3 4)1/2

61. Lt $x \to 0$ $\dfrac{x^2}{\int_0^x \tan^{-1} t\,dt} =$

1)1 2)2 3)3 4)4

62. $\underset{x\to 0}{Lt} \dfrac{\sqrt{1+x} - \sqrt[3]{1+x}}{x} =$

1)1/4 2)1/6 3)1/3 4)1/2

63. $\lim\limits_{x\to 0} \dfrac{\int_0^x Tan^2 x Sec^2 x dx}{x^3}$

1)2/3 2)1/3 3)1 4)0

KEY

1) 2	2) 2	3) 2	4) 2	5) 2	6) 4	7) 4	8) 2	9) 2	10) 1
11) 2	12) 1	13) 3	14) 3	15) 3	16) 3	17) 3	18) 4	19) 3	20) 3
21) 2	22) 2	23) 4	24) 3	25) 4	26) 3	27) 4	28) 4	29) 2	30) 3
31) 4	32) 3	33) 1	34) 3	35)	36) 4	37) 1	38) 4	39) 3	40) 3
41) 2	42) 4	43)2	44)3	45)3	46)1	47)3	48)1	49)1	50)4
51)2	52)1	53)4	54)1	55)1	56)3	57)2	58)3	59)4	60)3
61)2	62)2	63)							

25. DERIVATIVE

1. If f is differentiable at x then f ′ (x) = $\underset{x \to h}{Lt} \dfrac{f(x+h)-f(x)}{h}$

2. $\dfrac{d}{dx}(x^n) = nx^{n-1}$

3. $\dfrac{d}{dx}\left(\dfrac{1}{x^n}\right) = -\dfrac{n}{x^{n+1}}$

4. $\dfrac{d}{dx}(x) = 1$

5. $\dfrac{d}{dx}(c) = 0$

6. $\dfrac{d}{dx}(uv) = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$

7. $\dfrac{d}{dx}(u/v) = \dfrac{v\dfrac{du}{dx} - u\dfrac{dv}{dx}}{v^2}$

8. $\dfrac{d}{dx}(\sin x) = \cos x$

9. $\dfrac{d}{dx}(\cos x) = -\sin x$

10. $\dfrac{d}{dx}(\tan x) = \sec^2 x$

11. $\dfrac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x$

12. $\dfrac{d}{dx}(\sec x) = \sec x \tan x$

13. $\dfrac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x$

14. $\dfrac{d}{dx}(e^x) = e^x$

15. $\dfrac{d}{dx}(a^x) = a^x \log a$

16. $\dfrac{d}{dx}(\log x) = \dfrac{1}{x}$

17. $\dfrac{d}{dx}(\sin^{-1}x) = \dfrac{1}{\sqrt{1-x^2}}$

18. $\dfrac{d}{dx}(\cos^{-1}x) = -\dfrac{1}{\sqrt{1-x^2}}$

19. $\dfrac{d}{dx}(\tan^{-1}x) = \dfrac{1}{1+x^2}$

20. $\frac{d}{dx}\left(\cot^{-1} x\right) = \frac{-1}{1+x^2}$

21. $\frac{d}{dx}\left(\sec^{-1} x\right) = \frac{1}{|x|\sqrt{x^2-1}}$

22. $\frac{d}{dx}\left(\operatorname{cosec}^{-1} x\right) = \frac{-1}{|x|\sqrt{x^2-1}}$

23. $\frac{d}{dx}(\sinh x) = \cosh x$

24. $\frac{d}{dx}(\cos hx) = \sin hx$

25. $\frac{d}{dx}(\tan hx) = \operatorname{sech}^2 x$

26. $\frac{d}{dx}(\cot hx) = -\operatorname{cosech}^2 x$

27. $\frac{d}{dx}(\sec hx) = \operatorname{sech} x.\tanh x$

28. $\frac{d}{dx}(\operatorname{cosec} hx) = -\operatorname{cosec} hx . \cot hx$

29. $\frac{d}{dx}(\sin h^{-1} x) = \frac{1}{\sqrt{1+x^2}}$

30. $\frac{d}{dx}(\cos h^{-1} x) = \frac{1}{\sqrt{x^2-1}}$

31. $\frac{d}{dx}(\tan h^{-1} x) = \frac{1}{1-x^2}$

32. $\frac{d}{dx}\left(\coth^{-1} x\right) = \frac{1}{1-x^2}$

33. $\frac{d}{dx}\left(\operatorname{sech}^{-1} x\right) = \frac{-1}{x\sqrt{1-x^2}}$

34. $\frac{d}{dx}\left(\operatorname{cosech}^{-1} x\right) = \frac{-1}{|x|\sqrt{1-x^2}}$

35. $\frac{d}{dx}\left(\frac{1}{\sqrt{x}}\right) = \frac{-1}{2x\sqrt{x}}$

36. $\frac{d}{dx}\left(u^v\right) = u^v\left[\frac{v}{u}.u' + \log u.v'\right]$

37. If $y = \sqrt{f(x) + \sqrt{f(x) + \ldots\ldots\ldots\ldots\ldots\infty}}$ or $y = \sqrt{f(x) + y}$ then $\frac{dy}{dx} = \frac{f'(x)}{2y-1}$

38. If $y = f(x)^{f(x)^{f(x)^{\cdots\cdots\cdots\infty}}}$ then $\frac{dy}{dx} = \frac{y^2 f'(x)}{f(x)\left[1 - y\log f(x)\right]} = \frac{y^2 f'(x)}{f(x)\left[1 - \log y\right]}$

39. $\frac{d}{dx}|x| = \frac{|x|}{x}$

40. $\frac{d}{dx}\left(\log_a^x\right) = \frac{1}{x \log a}$

41. If y= $\sqrt{f(x)\sqrt{f(x)}\sqrt{f(x)} - - - -\infty}$ then $\frac{dy}{dx}$ =f ′ (x)

42. If x and y are function of t then $\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$

43. $\frac{d}{dx}\left[f(x)^{f(x)}\right] = f(x)^{f(x)}\left[1+\log f(x)\right]f'(x)$

44. If $x^m y^n = (x+y)^{m+n}$ then $\frac{dy}{dx} = \frac{y}{x}$

45. $\frac{d}{dx}\frac{1+\sin nx}{\sqrt{1-\sin nx}} = n\sec nx$

46. $\frac{d}{dx}\frac{1-\sin nx}{\sqrt{1+\sin nx}} = -n\sec nx$

47. $\frac{d}{dx}\frac{1-\cos nx}{\sqrt{1-\cos nx}} = -n\cos ec\, nx$

48. $\frac{d}{dx}\frac{1-\cos nx}{1+\cos nx} = n\cos ecnx$

49. If y = f(x) +1/y then $\frac{dy}{dx} = \frac{y^2.f'(x)}{y^2+1}$

50. $\frac{d}{dx}(\log ax) = \frac{1}{x}$

51. $\frac{d}{dx}\left[\sin^2 xf(x)\right] = \sin 2f(x).f'(x).\frac{d}{dx}\left[\cos^2 f(x) = -\sin 2f(x).f'(x)\right]$

53. $\frac{d}{dx}\frac{ax+b}{cx+d} = \frac{ad-bc}{(cx+d)^2}$

54. $\frac{d}{dx}\left(\frac{1}{x}\right) = \frac{-1}{x^2}$

55. $\frac{d}{dx}\left(x^x\right) = x^x(1+\log x)$

56. $\frac{d}{dx}\left\{\cos^n x\cos nx\right\} = n\cos^{n-1}\cos(n+1)x$

57. $\frac{d}{dx}\left\{\sin^n x\sin nx\right\} = n\sin^{n-1}x\sin(n+1)x$

58. $\frac{d}{dx}\{\cos^n x \sin nx\} = -n \cos^{n-1} x \sin (n+1) x$

59. $\frac{d}{dx}\{\sin^n x \cos nx\} = -n \sin^{n-1} x \cos (n+1) x$

60. If y = f(x, y) then $\frac{dy}{dx} = -\frac{f_x}{f_y}$

Exercise-A

1. $\underset{h \to 0}{Lt} \frac{\sqrt{x+h} - \sqrt{x}}{h} =$
   1) $1/\sqrt{x}$ 2) $1/2\sqrt{x}$ 3) $1/3\sqrt{x}$ 4) $1/2x$

2. $\underset{h \to 0}{Lt} \frac{\sin (3x+3h) - \sin 3x}{h}$
   1) 3cos3x 2) –sin3x 3) -3cos3x 4) cos3x

3. $\underset{h \to 0}{Lt} \frac{\tan \sqrt{x+h} - \tan \sqrt{x}}{h} =$
   1) $\sec^2 x$ 2) $\sec^2\sqrt{x}$ 3) $\sec^2\sqrt{x}/\sqrt{x}$ 4) $\text{Sec}^2\sqrt{x}/2\sqrt{x}$

4. $\underset{h \to 0}{Lt} \frac{e^{2x+2h} - e^{2x}}{h} =$
   1) $2e^{2x}$ 2) $-2e^{2x}$ 3) e^{-2x} 4) $-e^{-2x}$

5. d/dx (x+1/x)
   1) x^2-1 2) $1-1/x^2$ 3) $1+1/x^2$ 4) $-1/x^2$

6. d/dx $\log_a (x^2+1) =$
   1) $\log_e.2x$ 2) $\log_a e.2x /(1+x^2)$ 3) $-2x.\log_a e/(x^2+1)$ 4) $2x/(1+x^2)$

7. If $x^3y^2 = (x+y)^5$ then dy/dx
   1) x/y 2) -x/y 3) y/x 4) –x/y

8. If $x^{1/2} . y^{3/2} = (x+y)^2$ dy/dx
   1) x/y 2) y/x 3) -y/x 4) –x/y

9. d/dx $\sin^2 (e^x)$ (d/dx $[\sin^2 f(x)] = \sin 2f(x). f'(x)$)
   1) $e^x \sin 2e^x$ 2) $-e^x \sin 2e^x$ 3) $\sin 2e^x$ 4) $-\sin 2e^x$

10. d/dx $\sin^2$ (logx)
    1) sin 2logx 2) sin 2 log x.1/x 3) cos 2 log x. 4) cos 2 log x.1/x

11. d/dx $\sin^2 x$=
    1) sin 2x 2) 2 sinx 3) -sin2x 4) -2sin

12. d/dx ($\cos^2\sqrt{x}$)
1)$\sin 2\sqrt{x}$ 2)$\sin 2\sqrt{x}/2\sqrt{x}$ 3)$-\sin 2\sqrt{x}/2\sqrt{x}$ 4)$\cos 2\sqrt{x}/2\sqrt{x}$

13. d/dx ($\cos^2$ tanx)
1)$-\sin(2\tan x).\sec^2 x$ 2)$\sin 2(\tan x)$ 3)$\sin 2(\tan x)/\sec^2 x$ 4)$\sin 2\tan x.\sec^2 x$

14. d/dx [$10^x + x^{10} + 10^{10} + x^x$]
1)$10^x \log 10$ 2)$10^x \log 10 + 10x^9 + x^x(1+\log x)$ 3)$10^x \log x + x^x(1+\log x)$ 4)1

15. If $y = \cfrac{1}{x+\cfrac{1}{x+\cfrac{1}{x+1 \ldots\ldots \infty}}}$ then dy/dx =
1)y/(x+2y) 2)-y/(x+2y) 3)-y/(2x+y) 4)y/(2x+y)

16. If $y = \sqrt{\tan x + \sqrt{\tan x + \sqrt{\tan x} + \cdots\cdots \infty}}$ then dy/dx=
1)$\sec^2 x$ 2)$\sec^2 x/(2y-1)$ 3)$(2y-1).\sec^2 x$ 4)$(2y-1)/\sec^2 x$

17. If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x} + \cdots\cdots \infty}}$ then dy/dx =
1)cosx/(y-1) 2)cosy/(x-1) 3)cosx/(2y-1) 4)cosy/(2x-1)

18.If $y = x^{x^{\cdot^{\cdot^{\cdot^{\infty}}}}}$ then dy/dx = _____
1) y^2 / [x.(1-logy)] 2) y/[x.(1-logy)] 3) y^2/(1-logy) 4) y^2/(1-xlogy)

19.If $y = \sin x^{\sin x^{\cdots\infty}}$ then dy/dx
1) $y^2 \cot x$ / [1+y log (sinx)] 2) $y^2 \cot x$ / [1-y log (sinx)]
3) cotx/[1-log sinx] 4) cot x / [1+log sinx]

20.If $y = \sqrt{x}^{\sqrt{x}^{\cdots\infty}}$ then dy/dx
1) $-y^2$/ x[2-ylogx] 2) $-y^2$ / (2+y logx)
3) y^2 / [2-y logx] 4) y^2 / $[2x(1-y\log x)^{1/2}]$

21.If $y = e^{x+e^{x+\cdots\infty}}$ then dy/dx
1)y 2) 1/ (1-y) 3) 1/y 4) y/(1-y)

22.If $y = x^2 + \cfrac{1}{x^2 + 1/x^2 + \cdots\infty}$ dy/dx

(If y = f(x) +1/y
dy/dx = $y^2 f'(x)/y^2+1$)

(If y= f(x)$^{f(x)^{\cdots\infty}}$
dy/dx= $y^2 f'(x)/f(x)$ {1-logy}]

1) $y^2/(y^2+1)$ 2) $(y^2 \cdot 2x)/(y^2+1)$ 3) $-y^2/(y^2+1)$ 4) $-y^2 2x/(y^2+1)$

23. If $y = x + \cfrac{1}{x + \cfrac{1}{x + \cfrac{1}{x + ----\infty}}}$

then $\frac{dy}{dx} =$

1) $y/(2y-x)$ 2) $y/(x+2y)$ 3) $y/(x-2y)$ 4) y

24. $d/dx\ (e^x \log x)$ $\{d/dx\ (e^x f(x) = e^x\ [f(x) + f'(x)]\}$

1) $e^x \log x$ 2) $e^x (\log x + 1/x)$ 3) e^x/x 4) xe^x

25. $d/dx\ (e^x \tan x.)$

1) $e^x\ [\tan x.x^2]$ 2) $e^x\ [\tan x + \sec^2 x]$ 3) $e^x/\tan x.x^2$ 4) $e^x \sec^2 x$

26. $d/dx\ (e^x \sin x \log x)$

1) $e^x\ [\sin x \log x + (\sin x)/x + \log x \cos x]$ 2) $e^x \sin x \log x$ 3) $(e^x \sin x)/x$ 4) e^x/x

27. $d/dx\ (\log 5x)$ $(d/dx\ (\log ax) = 1/x)$

1) $1/x$ 2) $5/x$ 3) $-1/x$ 4) $x/5$

28. $d/dx\ (\log 10x)$

1) 1 2) $1/x$ 3) $-1/4$ 4) $d/dx\ (\log 100x)$

29. $d/dx\ \sqrt{x\sqrt{x\sqrt{x}}}$

1) $7/8\ x$ 2) $7/8\ x^{-1/8}$ 3) $7/8\ x^{7/8}$ 4) $8/7\ x^{8/7-1}$

30. $d/dx\ \sqrt{x\sqrt{x\sqrt{x\ldots\infty}}}$

1) 1 2) x 3) $1+x$ 4) $1-x$

31. $d/dx\ (\sqrt{x} + \sqrt{x\ \ }\ )$

1) $1/2\sqrt{x+\sqrt{x}}$ $(1+1/2\sqrt{x})$ 2) $1+(1/2\sqrt{x})$ 3) $1/(2\sqrt{x+\sqrt{x}})$ 4) 1

32. $xy=c^2$, $dy/dx=$_____

1) y/x 2) $-y/x$ 3) x/y 4) $-x/y$

33. If $2^x+2^y = 2^{x+y}$ then $dy/dx=$_____

1) 2^{x-y} 2) -2^{y-x} 3) $2xy$ 4) $2x+y$

34. $x^2+y^2=a^2$, $dy/dx =$_____

1) x/y 2) y/x 3) $-x/y$ 4) $-y/x$

35. $ax^2+2hxy + by^2 +2gx+2fy+c=0$, $dy/dx=$_____

1) $-[(ax+hy+g) / (hx+by+f)]$ 2) $[(ax+hy+g)/(hx+by+f)]$

3) [(hx+by+f)/(ax+hy+g)] 4) – [(hx+by+f)/(ax+hy+g)]

36. $ax^2+2hxy+by^2=0$, dy/dx=_____
1) –[(ax+hy)/(hx+by)] 2) [(ax+hy)/(hx+by)]
3) [(ax-by)/(hx-by)] 4) –[(ax-by)/(hx-by)]

37. $x^2+y^2+3xy=7$, dy/dx =_____
1)(2x+3y)/(2y+3x) 2) –(2x+3y)/(2y+3x)
3) (2y+3x)/(2x+3y) 4) –[(2y+3x)/(2x+3y)]

38. $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ then dy/dx=
1) bx/ay 2) ay/bx 3) b^2x/a^2y 4) a^2x/b^2y

39. d/dx [$\sin^{-1}$ ($2x\sqrt{1-x^2}$)] =_____
1) $1/\sqrt{1-x^2}$ 2) $2/\sqrt{1-x^2}$ 3) $x/\sqrt{1-x^2}$ 4) $2x/\sqrt{1-x^2}$

40. d/dx[$\cos^{-1}(2x^2-1)$]=_____
1)$2/\sqrt{1-x^2}$ 2) $-2/\sqrt{1-x^2}$ 3) $2/\sqrt{1+x^2}$ 4) $-2/\sqrt{1+x^2}$

41. d/dx [$\cos^{-1}$ $(1-x^2)/(1+x^2)$] =_____
1)$1/(1+x^2)$ 2) $2/(1-x^2)$ 3)$2/(1+x^2)$ 4) $2/[3(1+x^2)]$

42. d/dx [$\sin^{-1}(3x-4x^3)$]=_____
1) $3/\sqrt{1-x^2}$ 2) $-3/\sqrt{1-x^2}$ 3) $5/\sqrt{1+x^2}$ 4) $-5/\sqrt{1+x^2}$

43. d/dx [$\tan^{-1}$ $(2x/(1-x^2)$ + $\tan^{-1}$ $(1-x^2)/2x)$]=_____
1) $\frac{\pi}{2}$ 2) 0 3)1 4) $\frac{\pi}{4}$

44. d/dx [$\sin^{-1}$ $(1+x)/(1-x)$ +$\sec^{-1}(1-x)/(1+x)$]=_____
1)1 2) -1 3)2 4) 0

45. d/dx [$\sin^{-1}(x/\sqrt{1+x^2})$]=
1) $-1/(2\sqrt{1-x^2})$ 2) $1/(1+x^2)$ 3) $2/(1+x^2)$ 4) $2/(\sqrt{1-x^2})$

46. d/dx [$\sec(a^x+x^a)^2$]=
1)$\sec(a^x+x^a)^2$ $\tan(a^x+x^a)$ 2) $2[a^x+x^a]$
3)$\sec [a^x+x^a]^2\tan(a^x+x^a)^2 . 2(a^x+x^a) (a^x\log a+ax^{a-1})$ 4)1

47. d/dx $\sin^{-1}\sqrt{\frac{x^2}{x^2+a^2}}$ = _____
$\sqrt{a^2+x^2}$
1)$1/(a^2+x^2)$ 2) $-1/(a^2+x^2)$ 3) $a/(a^2+x^2)$ 4) $-a/(a^2+x^2)$

48. d/dx $[\tan^{-1}\sqrt{\frac{x^2}{x^2-a^2}}]=$

1) $1/(\sqrt{a^2-x^2})$ 2) $a/(\sqrt{a^2-x^2})$ 3) $1/(a^2+x^2)$ 4) $a/(a^2+x^2)$

49. d/dx $\tan^{-1}\left(\frac{x+\sqrt{x}}{1-x^{\frac{3}{2}}}\right)=$

1) $1/(1+x^2)$ 2) $[1/(1+x^2)][1/(1+x).2\sqrt{x}]$ 3) $1/[2\sqrt{x}(1+x)]$ 4) $-1/(1+x^2)$

50. d/dx $\left(\cos^{-1}\frac{x^{2n}-1}{x^{2n}+1}\right)$ =_____

1) $[2nx^{n-1}]/[x^{2n}+1]$ 2) $[2nx^n]/[x^n-1]$ 3) $[-2nx^{n-1}]/[x^{2n}+1]$ 4) $[2nx^{n-1}]/[x^{2n}-1]$

51. d/dx $\cos^{-1}\left(\frac{x-x^{-1}}{x+x^{-1}}\right)$ =_____

1) $2/(x+1)$ 2) $-2/(x^2+1)$ 3) $-2/(x+1)$ 4) $2/(x^2+1)$

52.. d/dx $\tan^{-1}\left(\frac{1+\cos x}{\sin x}\right)$ = _____

1) 1/2 2) 1/4 3) -1/4 4) -1/2

53. d/dx $\tan^{-1}\left(\frac{\cos x+\sin x}{\cos x-\sin x}\right)$ =_____

1) 1 2) -1 3) -2 4) 0

54. d/dx $\tan^{-1}\sqrt{\frac{1+\sin 2x}{1-\sin 2x}}$

1) -1 2) -2 3) 1 4) 0

55. d/dx $\tan^{-1}\left(\frac{1+\sin x}{\cos x}\right)$ = _____

1) 1 2) 1/2 3) -1/2 4) -1

56. d/dx$[\cot^{-1}(\text{cosec } x-\cot x)]$=_____

1) 1 2) 1/4 3) 1/2 4) -1/2

57. d/dx $[\tan^{-1}(a-bx)/(b+ax)]$ =_____

1) $a/(1+x^2)$ 2) $b/(1+x^2)$ 3) $-1/(1+x^2)$ 4) $1/(1+x^2)$

58. d/dx $\tan^{-1}\left(\frac{a\cos x+b\sin x}{b\cos x-a\sin x}\right)$ =_____

1) 1 2) $\tan^{-1}(a/b)$ 3) $\tan^{-1}(b/a)$ 4) -1

59. $d/dx\ [\sin^{-1}x + \sin^{-1}\sqrt{1-x^2}]$=_____
1) 0 2) 1 3) $1/\sqrt{1-x^2}$ 4) $2/\sqrt{1-x^2}$

60. $d/dx\ [\cos^{-1}x + \sin^{-1}\sqrt{1-x^2}]$ =_____
1) 0 2) 1 3) $2/\sqrt{1-x^2}$ 4) $-2/\sqrt{1-x^2}$

61. $d/dx\ [\tan^{-1} 4x/(1+5x^2) + \tan^{-1}(2+3x)/(3-2x)]$ =_____
1) $5/(1+x^2)$ 2) $5/(1-x^2)$ 3) $5/(1-25x^2)$ 4) $5/(1+25x^2)$

62. $d/dx\ [\sec^{-1}\sqrt{x+1}/\sqrt{x-1} + \sin^{-1}\sqrt{x-1}/\sqrt{x+1}]$ =_____
1) 1 2) -1 3) 0 4) $1/(1+x)$

63. $d/dx\ [\sin^{-1}2x/(1+x^2) + \sec^{-1}(1+x^2)/(1-x^2)]$ =_____
1) $1/(1+x^2)$ 2) $2/(1+x^2)$ 3) $4/(1+x^2)$ 4) $-1/(1+x^2)$

64. $d/dx\ [\sec^{-1} 1/\sqrt{1-x^2} + \cot^{-1}\sqrt{1-x^2}/x]$ =_____
1) $1/\sqrt{1-x^2}$ 2) $2/\sqrt{1-x^2}$ 3) $-1/\sqrt{1-x^2}$ 4) $-2/\sqrt{1-x^2}$

65. $d/dx\ [\tan x^n + \tan^n x + \tan^{-1}(a+x^n)/(1-ax^n)]$ =_____
1) $n\ [x^{n-1}\sec^2 x^n + \tan^{n-1}x \sec^2 x + x^{n-1}/(1+x^{2n}]$ 2) -1 3) 1 4) 0

66. $d/dx\ [\sin^{-1} 2x\sqrt{1-x^2} + \sec^{-1}1/\sqrt{1-x^2}]$ =_____
1) $1/\sqrt{1-x^2}$ 2) $2/\sqrt{1-x^2}$ 3) $3/\sqrt{1-x^2}$ 4) $4/\sqrt{1-x^2}$

67.
$d/dx\ [\tan^{-1}\sqrt{1-\cos x / 1+\cos x}]$ =_____
1) 1 2) 1/2 3) -1/2 4) -1

68. $d/dx\ [\tan^{-1}\ [(\sqrt{1+\sin x}+\sqrt{1-\sin x})/(\sqrt{1+\sin x}-\sqrt{1-\sin x})]$ =_____
1) 1 2) 2 3) -1 4) -1/2

69. $x = \log t$, $y = e^t$,dy/dx =_____
1) $-te^t$ 2) e^t 3) te^t 4) $-e^t$

70. $x = a\sec^2\theta$, $y = b\tan^2\theta$ dy/dx =_____
1) a 2) b 3) a/b 4) b/a

71. $x = \theta - 1/\theta$, $y = \theta + 1/\theta$, dy/dx =_____
1) x/y 2) y/x 3) –x/y 4) –y/x

72. $x = \cos\theta\ (1+\cos\theta)$, $y = \sin\theta(1+\cos\theta)$ then dy/dx at $\theta = \frac{\pi}{2}$ is _____
1) 1 2) 2 3) -1 4) -2

73. Derivative of sinx w.r.t to cos x is_____
1) tanx 2) –tanx 3) cot x 4) –cotx

74. Derivative of a^x w.r.t e^x is _____
1)a^x/loga 2) a^x loga 3) a^x loga/e^x 4) a^x/e^x

75. Derivative of $\log_{10}x$ w.r.t x^2 is _____
1)$1/2x^2$ 2) $1/[2x^2 \log 10]$ 3) $-1/2x^2$ 4) $-1/[2x^2\log10]$

76. Derivative of $e^{\sin-1x}$ w.r.t to log x is _____
1) $xe^{\sin-1 x}$ 2) $x/\sqrt{1-x^2}$ 3) $x\sqrt{1-x^2}$ 4) $x\, e^{\sin-1x}/\sqrt{1-x^2}$

77. Derivative of $\tan^{-1}(2x)/(1-x^2)$ w.r.t to $\cos^{-1}(1-x^2)/(1+x^2)$
1)1 2)-1 3)$2/(1+x^2)$ 4)$(1+x^2)/2$

78. d/dx $(x^{\sin x})$=_____
1)$x^{\sin x}(1+\log x)$ 2)$x^{\sin x}[(\sin x/x)+\log x.\cos x)]$ 3)cosx 4)logx.cosx

79. d/dx $(x)^{x^x}$ =_____

1)x^{x^x} $[(x^x/x)+\log x]$ 2)$x^x(1+\log x)$ 3)x^{x^x} $[(x^x/x)+\log x.\ x^x(1+\log x)]$ 4)1

80. d/dx $(e^x)^x$ =_____

1)$e^{x^x}(x^x)$ 2)e^{x^x} 3)xe^{x^x} 4)$e^{x^x}x^x(1+\log x)$

81. d/dx x^{e^x} =_____
1)$x^{ex}[(e^x/x)+\log x.e^x)]$ 2)xe^x/x 3)$(\log xe^x)/e^x$ 4)$xe^x\log xe^x$

82. d/dx $(e^{e^{e^{e^x}}})$=_____
1)$e^{e^{e^{e^x}}}$ 2)$e^{e^{e^{e^x}}}$ 3)$e^{e^{e^{e^x}}}$ 4)none

83. d/dx (log log logx) =_____
1)1/log(logx) 2)1/xlogx 3)(1/log(logx)).(1/x) 4)(1/log(logx)(logx).(1/x)

84. d/dx $[\log_7 (\log_7 x)]$=_____
1)1/log7 2)$1/\log_7 x$ 3)$1/\log_7 x.\log 7$ 4)$[1/(\log_7 x.\log 7)](1/(x\log 7)]$

85. d/dx (2x+3)/(5x+7)=_____
1)$1/(5x+7)^2$ 2)$-1/(5x+7)^2$ 3) $(5x+7)^2$ 4)- $(5x+7)^2$

86. d/dx (3x-1)/(2x+5) =_____
1)$17/(2x+5)^2$ 2)$17/(2x-5)^2$ 3)2x+5 4)2x-5

87. A: If $y=\sqrt{\sin x+y}$ then dy/dx=cosx/2y-1 _____
R: If $y=\sqrt{f(x)+y}$ then dy/dx=f'(x)/2y-1
1)Both A and R are true, R is correct reason of A
2)Both A and R are true, R is not correct reason of A
3)A true, R false 4)A false, R true

88 Match the following:

I. d/dx(2x-3/3x+1)	a)$29/(2x+7)^2$
II. d/dx(2x+3/3x+1	b)$41/(2x+7)^2$
III. d/dx(5x-3/2x+7)	c)$11/(3x+1)^2$
IV. d/dx(5x+3/2x+7)	d) $-7/(3x+1)^2$

1)a,c,d,b 2)b,a,c,d 3)c,d,a,b 4)c,d,b,a

89. If x=a(cosθ+θsinθ),y=a(sinθ-θcosθ) and dy/dx atθ=π/6,π/4,π/3 are respectively A,B,C then ascending order of A,B,C is ____
1)A<B<C 2)B<A<C 3)C<A<B 4)C<B<A

PREVIOUS EAMCET PAPER'S PROBLEMS

90. Derivative of an odd function is ____ (1997)
1)even function 2)odd function 3)neither odd nor even 4)none

91. $\frac{d}{dx}\cos^{-1}(\frac{4x^3}{27}-x)=$ (1997,2000)
1) $\frac{3}{\sqrt{9-x^2}}$ 2) $\frac{-1}{\sqrt{9-x^2}}$ 3) $\frac{-3}{\sqrt{9-x^2}}$ 4) $\frac{1}{\sqrt{9-x^2}}$

92. If $f(x) = \begin{vmatrix} 2\cos x & 1 & 0 \\ x-\pi/2 & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$ then df/dx at x= $\pi/2$ is (1998)
1) 2 2) π/2 3)1 4) 8

93. If tan y = $2t/(1-t^2)$, sinx = $2t/(1+t^2)$, dy/dx=_____ (1998)
1) 0 2) cosx 3) tanx 4)1

94. If $y=\cot^{-1}[\tan(\pi/2-x)]$ then dy/dx= [1999]
1)x 2)1 3)$1/(1+x^2)$ 4)$-1/(1+x^2)$

95. If $y=x^x$ then dy/dx= [1999]
1)x^x 2)$x^x\log x$ 3)$x^x(1+\log x)$ 4)$x^x/\log x$

96. If x=θ-1/θ, y=θ+1/θ then dy/dx= [1999]
1)x/y 2)y/x 3)-x/y 4)-y/x

97. Derivative of $\sin^{-1}x$ w.r.t $\cos^{-1}\sqrt{(1-x^2)}$ [1999]
1)$1/(1-x^2)$ 2)$\cos^{-1}x$ 3)1 4)0

98. $d/dx[\cos^{-1}x+\sin^{-1}\sqrt{(1-x^2)}]=$ [1999]
1)x 2)y 3)2y-1 4)$-2/\sqrt{1-x^2}$

99. If $xy=(x+y)^n$ and $dy/dx=y/x$, then n= [2000]
1)1 2)2 3)3 4)4

100. If $y= 2^{2^x}$ then dy/dx= [2000]
1)$y(\log_{10}2)^2$ 2)$y(\log_e2)^2$ 3)$y.2^x.(\log_e2)^2$ 4)$y(\log_e2)$

101. If $y=2^{2x}$, then dy/dx [2000]
1)$y(\log_{10}2)^2$ 2) $y(\log_e2)^2$ 3)$y.2x.(\log_e2)^2$ 4)$y(\log_e2)^2$

102. If $f(x)=x^2/(x+a)$ then $f''(a)=$ [2001]
1)4a 2)1/8a 3)1/4a 4)8a

103. If $h(x)= e^{e^x}$ then $\frac{h'(x)}{h(x)}=$ [2001]
1)h(x) 2)1/h(x) 3)logh(x) 4)-logh(x)

104. $d/dx[\sin^{-1}(3x/2 - x^3/2)]=$ [2001]
1)$3/\sqrt{(4-x^2)}$ 2)$-3/\sqrt{(4-x^2)}$ 3)$1/\sqrt{(4-x^2)}$ 4)$-1/\sqrt{(4-x^2)}$

105. If $y=ae^x+be^{-x}+c$ where a,b,c are parameters then $y'''=$ [2002]
1)y 2)y′ 3)0 4)y″

106. If $f(x)= \sqrt{ax}+\frac{a^2}{\sqrt{ax}}$ then $f'(a)=$ [2002]
1)a 2)0 3)1 4)-1

107. Let $f(x)=e^x$, $g(x)=\sin^{-1}x$ and $h(x)=f[g(x)]$ then $\frac{h'(x)}{h(x)}=$ [2002]
1)$\sin^{-1}x$ 2)$1/\sqrt{1-x^2}$ 3)$1/(1-x^2)$ 4) $e^{\sin x^{-1}}$

108. If $f(x)=\frac{x}{1+|x|}$ for $x\in R$ then $f'(0)=$ [2003]
1)0 2)1 3)2 4)3

109. $y=\sin^{-1}x \Rightarrow (1-x^2)d^2y/dx^2=$____ (2004)
1)-xdy/dx 2)0 3)xdy/dx 4)$x(dy/dx)^2$

110. $x>0, x^y=e^{x-y} \Rightarrow dy/dx=$____ (2004)

1)$1/(1+\log x)^2$ 2)$\log x/(1+\log x)^2$ 3)$[\log x/(1+\log x)]^2$ 4)$(\log x)^2/(1+\log x)$

111. If f:R→R is an even function having derivatives of all orders, then an odd function among the following is (2004)
1) f″ 2) f‴ 3)f′+f″ 4)f″+f‴

112. f(x)=10cosx+(13+2x)sinx⇒ $f''(x)+f(x)=$ (2005)
1)cosx 2)4cosx 3)sinx 4)4sinx

113. Observe the following statements: (2005)
I.$f(x)=ax^{41}+bx^{-40} \Rightarrow \frac{f''(x)}{f(x)}=1640x^{-2}$
II. $d/dx \tan^{-1}[2x/(1-x^2)] = 1/(1+x2)$
Which of the following is correct?
1)I is true, but II is false 2)Both I and II are true
3)Neither I nor II is true 4)I false, but II is true

114. If f:R →R is an even function which is twice differentiable on R and f″ (π)=1 then f″(-π)= __
1)-1 2)0 3)1 4)2 (2005)

115. $x\sqrt{1+y}+y\sqrt{1+x}=0 \Rightarrow \frac{dy}{dx}=$
1) $\frac{1}{(1+x)^2}$ 2) $\frac{-1}{(1+x)^2}$ 3) $\frac{1}{1+x^2}$ 4) $\frac{1}{1-x^2}$

116. $x^y = y^x \Rightarrow x(x-y\log x)\frac{dy}{dx}=$ (2006)
1)y(y-xlog y) 2)y(y+xlog y) 3)x(x+ylog x) 4)x(y-xlogy)

117. If $2x^2-3xy+y^2+x+2y-8=0$ then dy/dx = (2007)
1) $\frac{3y-4x-1}{2y-3x+2}$ 2) $\frac{3y+4x+1}{2y+3x+2}$ 3) $\frac{3y-4x+1}{2y-3x-2}$ 4) $\frac{3y-4x+1}{2y+3x+2}$

118. $x=\cos\theta$, $y=\sin 5\theta \Rightarrow (1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}=$ (2007)
1)-5y 2)5y 3)25y 4)-25y

119. If $x=\cos\theta+\log\tan(\frac{\theta}{2})$ and $y=a\sin\theta$ then $\frac{dy}{dx}=$ (2008)
1)$\cot\theta$ 2)$\tan\theta$ 3)$\sin\theta$ 4)$\cos\theta$

120. If y=sin(logx) then $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}=$ (2008)

1) sin(logx) 2) cos(logx) 3) y^2 4)-y

121. x = $\frac{1-\sqrt{y}}{1+\sqrt{y}} \Rightarrow \frac{dy}{dx} =$ (2009)

1) $\frac{4}{(x+1)^2}$ 2) $\frac{4(x-1)}{(1+x)^3}$ 3) $\frac{x-1}{(1+x)^3}$ 4) $\frac{4}{(x+1)^3}$

122. x = $\cos^{-1}\left(\frac{1}{\sqrt{1+t^2}}\right)$, y = $\sin^{-1}\left(\frac{t}{\sqrt{1+t^2}}\right) \Rightarrow \frac{dy}{dx} =$ (2009)

1) 0 2) tan t 3) 1 4) sin t cos t

123. $\frac{d}{dx}\left[a\tan^{-1}x + b\log\left(\frac{x-1}{x+1}\right)\right] = \frac{1}{x^4-1} \Rightarrow a-2b =$ (2009)

1) 1 2) –1 3) 0 4) 2

124. $f(x) = (\cos x)(\cos 2x).....(\cos nx) \Rightarrow f'(x) + \sum_{r=1}^{n}(r\tan rx)f(x) =$

[2010]

1) f(x) 2) 0 3) –f(x) 4) 2f(x)

125. $y = \cos^{-1}\left(\frac{a^2-x^2}{a^2+x^2}\right) + \sin^{-1}\left(\frac{2ax}{a^2+x^2}\right) \Rightarrow \frac{dy}{dx} =$ [2010]

1) $\frac{a}{x^2+a^2}$ 2) $\frac{2a}{x^2+a^2}$ 3) $\frac{4a}{x^2+a^2}$ 4) $\frac{a^2}{x^2+a^2}$

126. $f(x) = \sin x + \cos x \Rightarrow f\left(\frac{\pi}{4}\right)f^{(iv)}\left(\frac{\pi}{4}\right) =$ [2010]

1) 1 2) 2 3) 3 4) 4

127. $y = \cos^{-1}\left(\frac{a^2-x^2}{a^2+x^2}\right) + \sin^{-1}\left(\frac{2ax}{a^2+x^2}\right) \Rightarrow \frac{dy}{dx} =$ (2010)

1) $\frac{a}{x^2+a^2}$ 2) $\frac{2a}{x^2+a^2}$ 3) $\frac{4a}{x^2+a^2}$ 4) $\frac{a^2}{x^2+a^2}$

128 $f(x) = \sin x + \cos x \Rightarrow f\left(\frac{\pi}{4}\right)f^{(iv)}\left(\frac{\pi}{4}\right) =$ (2010)

1) 1 2) 2 3) 3 4) 4

129. If $y=(1+x)(1+x^2)(1+x^4).....(1+x^{2^n})$, then $\left(\frac{dy}{dx}\right)_{x=0}=$ [2011]

1) 0 2) $\frac{1}{2}$ 3) 1 4) 2

130. If $\cos^{-1}\left(\frac{x^2-y^2}{x^2+y^2}\right)=k$ (a constant), then $\frac{dy}{dx}=$ [2011]

1) $\frac{y}{x}$ 2) $\frac{x}{y}$ 3) $\frac{x^2}{y^2}$ 4) $\frac{y^2}{x^2}$

131. If $f(x)=|x|+\sin|x|$ for $x\in\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$, then its left hand derivative at x = 0 is [2011]

1) 0 2) -1 3) -2 4) -3

132. $f(x)=\log\left[e^x\left(\frac{x-2}{x+2}\right)^{3/4}\right]\Rightarrow f'(0)=$ [2012]

1) $\frac{1}{4}$ 2) 4 3) $\frac{-3}{4}$ 4) 1

133. If $xy\neq 0$, $x+y\neq 0$ and $x^m y^m=(x+y)^{m+n}$ where $m,n\in N$ then $\frac{dy}{dx}=$ [2012]

1) $\frac{y}{x}$ 2) $\frac{x+y}{xy}$ 3) xy 4) $\frac{x}{y}$

134. $x^2+y^2=t+\frac{1}{t}, x^4+y^4=t^2+\frac{1}{t^2}\Rightarrow x^3y\frac{dy}{dx}=$ [2012]

1) -1 2) 1 3) 0 4) 1

135. $f(x)=\frac{1}{1+\frac{1}{x}}; g(x)=\frac{1}{1+\frac{1}{f(x)}}\Rightarrow g'(2)=$ [2013]

1) $\frac{1}{5}$ 2) $\frac{1}{25}$ 3) 5 4) $\frac{1}{16}$

136. $y=tan^{-1}\left(\frac{\sqrt{1+a^2x^2}-1}{ax}\right)\Rightarrow(1+a^2x^2)y''+2a^2xy'=$ (2014)

1) a^2 2) $2a^2$ 3) 0 4) $-2a^2$

137. If $f(x) = \frac{x}{\quad}$ & g(x) = f(f(x)) then $g'(x) =$ (2014)

1) $\frac{1}{(x+1)^2}$ 2) $\frac{1}{x^2}$ 3) $\frac{1}{(2x+1)^2}$ 4) $\frac{1}{(2x+3)^2}$

138. If $x = \frac{1-\sqrt{y}}{1+\sqrt{y}}$ then $(x+1)\frac{d^2y}{dx^2} + \left(\frac{3\sqrt{y}+1}{\sqrt{y}}\right)\frac{dy}{dx} =$ (2015)

1) -2y 2) 0 3) –y 4) y

139. If $x^2 + y^2 = t + \frac{2}{t}$ & $x^4 + y^4 = t^2 + \frac{4}{t^2}$, then $x^3 y \frac{dy}{dx} =$ (2015)

1) -1 2) -2 3) $\frac{y}{x}$ 4) xy

140. If $y = tan^{-1}\left(\frac{3x - x^3}{1-3x^2}\right) + tan^{-1}\left(\frac{4x - 4x^3}{1-6x^2+x^4}\right)$ then $\frac{dy}{dx} =$ (2015)

1) $\frac{2}{1+x^2}$ 2) $\frac{4}{1+x^2}$ 3) $\frac{6}{1+x^2}$ 4) $\frac{7}{1+x^2}$

141. If f is defined by $f(x) = \begin{cases} x, & for\ 0 \le x < 1 \\ 2-x, & for\ x \ge 1, \end{cases}$ then at x = 1, if f is 3 (2015 A.P)

1) continuous differentiable 2) continuous but not differentiable
3) discountinuous but differentiable 4) neither continuous not differentiable

142. If $x^2 + y^2 = t + \frac{1}{t}$ & $x^4 + y^4 = t^2 + \frac{1}{t^2}$ then $\frac{dy}{dx} =$ (2015 A.P)

1) $\frac{-x}{y}$ 2) $\frac{-y}{x}$ 3) $\frac{x^2}{y^2}$ 4) $\frac{y^2}{x^2}$

143. Let D be the domain of a twice differentiable function f. For all $x \in D$,
$f''(x) + f(x) = 0$ & $f(x) = \int g(x)dx + c$. If $h(x) = f(x)^2 + (g(x))^2$ & h(0)=5
then h(2015)–h(2014)= (2015 A.P.)

1) 5 2) 3 3) 0 4) 1

144. If $x = at^2$ & $y = 2at$ then $\frac{d^2y}{dx^2}$ at t = 1/2 is (2015 A.P)

1) $\frac{-2}{a}$ 2) $\frac{4}{a}$ 3) $\frac{8}{a}$ 4) $\frac{-4}{a}$

145. If $y = Tan^{-1}\left[\frac{5\cos x - 12\sin x}{12\cos x + 5\sin x}\right], then \frac{dy}{dx} =$ (2016)

1) 1 2) -1 3) -2 4) $\frac{1}{2}$

146. $\frac{d}{dx}\tan^{-1}\left[\frac{\sqrt{1+\sin x}-\sqrt{1-\sin x}}{\sqrt{1+\sin x}+\sqrt{1-\sin x}}\right] =$ (2016)

1) 1 2) $-\frac{1}{2}$ 3) $\frac{1}{2}$ 4) – 1

147. If y = acos(sin2x) + bsin(sin2x), then $y''+(2\tan 2x)y' =$ (2016)

1) 0 2) $4(\cos^2 2x)y$ 3) $-4(\cos^2 2x)y$ 4) $-(\cos^2 2x)y$

148. Define $f(x) = \begin{cases} x^2+bx+c, & x<1 \\ x & x\geq 1 \end{cases}$, If f(x) is differentiable at x = 1 then (b - c) = (2016AP)

1) – 2 2) 0 3) 1 4) 2

149. If x = a is a root of multiplicity two of a polynomial equation f(x) = 0, then (2016AP)

1) $f'(a) = f''(a) = 0$ 2) $f''(a) = f(a) = 0$

3) $f'(a) \neq 0 \neq f''(a)$ 4) $f'(a) = 0; \neq f''(a) \neq 0$

150. If $y = \log_2(\log_2 x)$, then $\frac{dy}{dx} =$ (2016AP)

1) $\frac{\log 2}{x\log_e x}$ 2) $\frac{1}{\log_e (2x)^x}$ 3) $\frac{1}{(x\log_e x)\log_e 2}$ 4) $\frac{1}{x(\log_2 x)^2}$

151. If f is differentiable, f(x + y) = f(x) f(y) for all x, y $\in R$, f(3) = 3, f(0) = 11, then $f'(3) =$ (2017)

1) $\frac{3}{11}$ 2) $\frac{11}{3}$ 3) 8 4) 33

152. f: (-1,1) → R be a differentiable function with f(0) = -1 & f(0) = 1. If f(x) = $(f(2f(x)+2))^2$, then $g'(0) =$ (2017)

1) 0 2) -2 3) 4 4) -4

153. If y = $x^x + x^7 + 7^x + 7^7$, then $\frac{dy}{dx} =$ (2017AP)

1) $x.x^{x-1} + 7x^6 + x7^{x-1}$ 2) $x^x(1+\log_e x) + 7x^6 + 7^x(\log_e 7)$

3) $x^x(1+\log_e x) + 7x^6 + x.7^{x-1}$ 4) $x.x^{x-1}\log_e x + 7x^6 + 7^x(\log_7 e)$

154. The derivative of e^{3x} sin4x with respect to x is (2017AP)

1) $5e^{3x}\sin\left(4x+Tan^{-1}\frac{4}{3}\right)$ 2) $5e^{3x}\sin\left(4x-Tan^{-1}\frac{4}{3}\right)$

3) $5e^{3x}\sin\left(4x+Tan^{-1}\frac{3}{4}\right)$ 4) $5e^{3x}\sin\left(4x-Tan^{-1}\frac{3}{4}\right)$

155. y = a cosx + (b + 2x) sinx = $y''+y=$ (2017AP)

1) cosx 2) 2cosx 3) 3cosx 4) 4cosx

KEY

1) 2	2) 1	3) 4	4) 1	5) 2	6) 2	7) 3	8) 2	9) 1	10) 2
11) **1**	12) **3**	13) **1**	14) **2**	15) **2**	16) **3**	17) **1**	18) **2**	19) **4**	20) **2**
21) **1**	22) **2**	23) **2**	24) **1**	25) **1**	26) **2**	27) **2**	28) **2**	29) **1**	30) **1**
31) **2**	32) **3**	33) **1**	34) **1**	35) **2**	36) **2**	37) **2**	38) **2**	39) **31**	40) **1**
41) **2**	42) **3**	43) **2**	44) **3**	45) **1**	46) **3**	47) **1**	48) **2**	49) **2**	50) **3**
51) **3**	52) **1**	53) **2**	54) **3**	55) **2**	56) **4**	57) **3**	58) **1**	59) **1**	60) **4**
61) **3**	62) **3**	63) **3**	64) **2**	65) **1**	66) **3**	67) **2**	68) **4**	69) **3**	70) **4**
71) **1**	72) **1**	73) **4**	74) **4**	75) **2**	76) **4**	77) **1**	78) **2**	79) **3**	80) **4**
81) **1**	82) **3**	83) **4**	84) **3**	85) **2**	86) **1**	87) **1**	88) **4**	89) **1**	90) **1**
91) **3**	92) **1**	93) **4**	94) **2**	95) **3**	96) **1**	97) **3**	98) **4**	99) **2**	100) **3**
101) **3**	102) **3**	103) **3**	104) **1**	105) **2**	106) **2**	107) **2**	108) **2**	109) **3**	110) **2**
111) **2**	112) **2**	113) **1**	114) **3**	115) **2**	116) **1**	117) **1**	118) **4**	119**)2**	120)**4**
121) **2**	122) **3**	123) **2**	124) **2**	125) **3**	126) **2**	**127) 3**	**128) 2**	129) 1	130) 1
131) 3	132) **1**	133) **1**	134) **1**	135) **2**	136) **3**	137) **3**	138) **2**	139) 2	140) 4
141) **2**	142) **2**	143) **3**	144) **4**	145) **2**	146) **3**	147) **3**	148) **1**	149) 4	150) 3
151) **4**	152) **4**	153) **2**	154) **1**	155) **4**	156)	157)	158)	159)	160)

AIEEE PROBLEMS

1. If $(x+y)^{m+n}=x^m y^n$ then $\frac{dy}{dx}=$ [2006]

1) x/y 2) $-y/x$ 3) $-x/y$ 4) y/x

2. If the function f is defined by $f(x)=\frac{x}{1+|x|}$ then at what points is f differentiable [2006]

1) every where2) at $x=\pm1$ 3) except at $x=0$ 4) except at $x=0$ or ±1

3. If $x=e^{y+e^{y+\ldots to\infty}}$, $x>0$, then $\frac{dy}{dx}$ is [2004]

1) $\frac{x}{1+x}$ 2) $\frac{1+x}{x}$ 3) $\frac{1-x}{x}$ 4) $\frac{1}{x}$

4. If $f(x) = -\left(\frac{1}{|x|}+\frac{1}{x}\right)$ for $x \neq 0$ and $f(0) = 0$ then $f(x)$ is [2003]
   1) continuous as well as differentiable for all x
   2) continuous for all x but not differentiable at $x = 0$
   3) neither differentiable nor continuous at $x = 0$
   4) discontinuous everywhere

5. Let $f(a) = g(a) = k$ and their nth derivatives $f^{(n)}(a)$, $g^{(n)}(a)$ exists and are not equal for some n. Further if $\underset{x \to a}{Lt} \dfrac{f(a)g(x) - f(a) - g(a)f(x) + g(a)}{g(x) - f(x)} = 4$ then $k =$ [2003]

   1) 4 2) 2 3) 1 4) 0

6. If $x = 3\cos\theta - 2\cos^3\theta$, $y = 3\sin\theta - 2\sin^3\theta$ then $\dfrac{dy}{dx} =$ [2002]

   1) $\tan\theta$ 2) $\cot\theta$ 3) $\cot\dfrac{\theta}{2}$ 4) $\tan\dfrac{\theta}{2}$

KEY

1) 4	2) 1	3) 3	4) 2	5)	6) 2

Exercise-B

1. If $x^y=e^{x-y}$ then dy/dx=____
   1)$1/(1+\log x)^2$ 2)$\log x/(1+\log x)^2$ 3)$(\log x/1+\log x)^2$ 4)$\log x/(1+\log x)$

2. If $x=e^{y+e^{y+\ldots\ldots\infty}}$, $x>0$ then dy/dx=____
   1)x/1+x 2)1+x/x 3)1-x/x 4)1/x

3. If f(x)=|x| at x=0 then Lt f(x) is _____
   1)f(x) is not differentiable at x=0 2)f(x) is continuous at x=0
   3)f(x) is differentiable at d=0 4) none

4. Match the following:
   I. d/dx(2x-3/3x+1) a)$29/(2x+7)^2$
   II. d/dx(2x+3/3x+1 b)$41/(2x+7)^2$
   III. d/dx(5x-3/2x+7) c)$11/(3x+1)^2$
   IV. d/dx(5x+3/2x+7) d) $-7/(3x+1)^2$
   1)a,c,d,b 2)b,a,c,d 3)c,d,a,b 4)c,d,b,a

5. If $x^y=\log x$ then at x=e, dy/dx=__
   1)e 2)1/e 3)1 4)0

6. If ysinx=x+y then x=0,dy/dx=_____
   1)-1 2)2 3)1 4)-2

7. The function $f(x)=x/1+|x|$ is differentiable
1)everywhere 2)exceptatx=±1 3)except atx=0 4)except atx=0, ±1

8. If $f(x)= |x-1| +|x-3|$ then $f'(2)$=____
1)-2 2)2 3)0 4)1

9. The function $f(x)=|x^3|$ is ____
1)differentiable at x=0 2)continuous but not differentiable at x=0
3) discontinuity at x=0 4)a function with range$(-\infty,\infty)$

10. Derivative of $\cos^{-1}(2x^2-1)$ w.r.t $\cos^{-1}x$ is ___
1)-2 2)2 3)0 4)1

11. If $d/dx[(1+x^2+x^4)/(1+x+x^2)= ax+b$ then [a,b]=__
1)(2,-1) 2)(1,2) 3)(-1,-2) 4)(-2,-1)

12. At $x=1, f(x)=x^3-1$ $1<x<\infty$
$= x-1$ $-\infty <x\leq 1$ is
1)f(x) is continuous and differentiable
2)f(x) continuous but not differentiable
3) discontinuous 4) none

13. Derivative of $\sin^{-1}x$ w.r.t $\cos^{-1}\sqrt{1-x^2}$ is
1)$1/\sqrt{1-x^2}$ 2)$\cos^{-1}x$ 3)1 4)0

14. The derivativeof $\sin^{-1}x/1+\sin^{-1}x$ w.r.t $\sin^{-1}x$

1)$1/\sqrt{1-x^2}$ 2)$\sin^{-1}x/\sqrt{1-x^2}$ 3)$1/(1+\sin^{-1}x)^2$ 4)$1/\sqrt{1-x^2}\ (1+son^{-1}x)^2$

15. Derivative of $\sec^{-1}(1/2x^2-1)$ w.r.t $\sqrt{1+3x}$ at x=1/3 is
1)0 2)1/2 3)1/3 4)1/6

16. $\cos^{-1}(x^2-y^2/x^2+y^2) = \log a$ then dy/dx=
1)-x/y 2)-y/x 3)y/x 4)x/y

17. $d/dx\{\sin^2(\cot^{-1}\sqrt{1+x/1-x})\}$=
1)-1/2 2)0 3)1/2 4)-1

18. If $y=\tan^{-1}(\cos x-\sin x/\cos x+\sin x)$ then dy/dx=
1)-1 2)0 3)1 4)π /4-1

19. $x=1+t/t^3$ and $y= 3+4t/2t^2$ then $x(y')^3$=
1)1- y' 2)1+ y'' 3) y' -1 4) y'

20. 20.If $y=\sin^{-1}(1-x^2/1+x^2)$ then dy/dx=
1)$-2/1+x^2$ 2)$2/1+x^2$ 3)$-1/1+x^2$ 4)$1/1+x^2$

21. If $x^m.y^n= (x+y)^{m+n}$ then dy/dx=

1)-x/y 2)-y/x 3)x/y 4)y/x

22. If $x=a\cos^3\theta$, $y=a\sin^3\theta$ then $\sqrt{1+(dy/dx)^2}$
1)cosec θ 2)sec θ 3)sin θ 4)cos θ

23. If $y=\sec(\tan^{-1}x)$ then dy/dx=

1)$-x/\sqrt{1+x^2}$ 2)$x/\sqrt{1+x^2}$ 3)$-x/\sqrt{x^2-1}$ 4)$x/\sqrt{x^2-1}$

24. If $y=\tan^{-1}(\sec x+\tan x)$ then dy/dx=
1)-1/2 2)0 3)1/2 4)1

25. Derivative of $\sin^2 x$ w.r.t $(\log x)^2$ is
1)xsinxcosx/logx 2)2xsinxcosx/logx 3)$x\sin^2 x/2\log x$ 4)2sinx/logx

KEY

1) 2	2) 3	3) 1	4) 4	5) 2	6) 1	7) 1	8) 3	9) 1	10) 2
11) 1	12) 2	13) 3	14) 3	15) 1	16) 3	17) 1	18) 1	19) 2	20) 1
21) 4	22) 2	23) 2	24) 3	25) 1					

26. a) ERRORS

1. $\delta f = f'(x) . \delta x$
2. $f(x+\delta x) = f(x) + f'(x). \delta x$
3. Relative error in f= $\delta f/f$
4. Percentage error in f= $\frac{\delta f}{f} \times 100$
5. $\delta y = dy = df = f'(x) . \delta x$
6. Circle :- Area = Πr^2
   circumference = $2\Pi r$
7. Cube :- Surface area = $6(\text{side})^2$
   Lateral surface area = $4 (\text{side})^2$
   Volume = $(\text{side})^3$
8. Sphere :- Surface area = $4 \Pi r^2$
   Volume = $\frac{4}{3} \Pi r^3$
9. cylinder :- Lateral surface area = $2\Pi rh$
   Total surface area = $2\Pi rh+2\Pi r^2$
   Volume = $\Pi r^2 h$
10. Cone :- Lateral surface area = $\Pi rl = \Pi r\sqrt{r^2+h^2}$
    Total surface area = $\Pi rl+ \Pi r^2$
    Volume = $\frac{1}{3} \Pi r^2 h$
    $\tan\theta = \frac{r}{h}$
    Where l = slant height
    h= height
    r=radius
    θ= semi- vertical angle
11. sector :- Area of sector = $\frac{1}{2} lr = 1/2\, r^2\theta$
    (Length of Arc) $l = r\theta$
    (Perimeter) $P= l+2r$
    $=r\theta+2r$
    $P=r(\theta+2)$
    Where θ=angle
12. Simple Pendulum: - If l = length
    T= time period
    g = acceleration due to gravity
    $T=2\Pi \sqrt{\frac{l}{g}}$
13. % error in T= ½ % error in l

Exercise-A

Find the approximate value of

1. $\cos 61^0$ $[f(x+\delta x) = f(x) + f'(x)\,\delta x]$
   1)1.0349 2) 0.793 3) 0.487 4) 1.00058
2. $\sin 46^0$
   1)1) 0.917 2) 0.4971 3) 0.1947 4) 0.7194
3. $\tan 46^0$
   1)1.0349 2) 1.0457 3) 2.034 4) 2.341
4. $\sin 60^0\, 1'$
   1)0.86615 2) 1.86615 3) 8.615 4) 0.0866
5. $\sqrt{16.01}$
   1)4.00125 2) 4.125 3) 4.0125 4) 4.015
6. $\sqrt[3]{8.08}$
   1)2.67 2) 2.7 3) 2.067 4) 2.0067
7. $\sqrt{626}$
   1)25 2) 25.10 3) 25.02 4) 0.25
8. $\operatorname{cosec} 47^0$
   1)1.2647 2) 1.3647 3) 0.3647 4) 1.03647
9. $\sin 62^0$
   1)0.88345 2) 0.8345 3) 0.0883 4) 8.8345
10. $\dfrac{1}{\sqrt[4]{16.16}}$
    1)0.1999 2) 4.0008 3) 0.49875 4) 0.4983
11. $f(x) = 2x^2+3x-5$, $x=3$, $\delta x = .02$, δf=_____ $[\delta f = f(x+\delta x) - f(x)]$
    1)0.3008 2) 0.3 3) 0.3080 4) 0.8
12. $f(x) = \dfrac{x^2}{2} + 4x$, $x=2$, $\delta x=0.1$, δf=____

    1)0.6 2) 0.605 3) 2.5 4) 2.625
13. Find the approximate volume of cube of side 10.01 cm.
    1) 103c.cm 2) 1003 c.cm 3) 110 c.ccm 4) 1010 c.cm
14. While measuring the radius of a sphere there is an error of 0.02 cm. Find the approximate error in its volume when the radius is 3cm.
    1)72π c.c 2) 0.72 πc.c. 3) 7.2 πc.c 4) 72 c.c
15. The radius of sphere increases from 10cm to 10.02 cm. Find approximate error in its surface area.
    1)0.6 π cm^2 2) 1.6 πcm^2 3)0.6cm^2 4) 6πcm^2

16. While measuring the radius of a sphere 5cm there is an error of 0.06cm. Find the relative error in its volume.
1)0.36 2) 3.6 3) 0.036 4) 0.6

17. If there is an error of 1/10% in the radius of a sphere, find the percentage error in its volume.
1) 3/10 % 2) 1/8% 3) 1/7% 4) 3/2%

18. There is an error of 1% in the measurement of the axis of an ellipse. Find the percentage error in its area.
1)1% 2) 2% 3)3% 4) 4%

19. The radius of a circular plate is found by measurement to be 5 cm with an error of 0.3 cm. Find percentage error in area.
1)2 2)6 3) 8 4)12

20. In a ΔABC the side a and angle A remains constant while other elements are changed slightly, then δb sec B+δc sec C =_____
1)0 2)1 3)a 4) a/A

21. An electric current is measured by a tangent galvanometer, the current being proportional to the tangent to the angle of deflection. If the deflection is read as 45^0 and an error of 1% is made in reading it, the percentage error in current is ___
1) π% 2) π/2% 3) π/4% 4) π/3 %

22. The angle A of ΔABC is found by measurement to be 63^0 and the area is calculated by the formula 1/2 bc sinA. Percentage error in area is ___ if an error of 15′ is there in measured value of A.
1) 5π/54 cot 47^0 2) πbc/1440 cos 63^0
3) 5π/36 cot 63^0 4) πbc/1120 cos 42^0

23. The focal length of a mirror is given by formula 2/f = 1/v-1/u. If equal errors α are made in measuring u and v then relative error in f is_____
1)2/α 2) α(1/u+1/v) 3) α (1/u-1/v) 4) α

24. Find the approximate increase in the area of a square plate when each side expands from 3 cm to 3.01cm.
1) 0.6 cm^2 2) $6cm^2$ 3) $0.06cm^2$ 4) $0.006cm^2$

25. A right circular cone have its radius equal to is altitude. If the altitude is 10 cm with 0.01 cm error, find error in volume.
1)π cm^3 2) $2\pi cm^3$ 3) $\pi/2cm^3$ 4) $-2\pi cm^3$

26. A wire of length 20 cm is bent to form a circle. Find the change in area if 5cm of wire is cut out.
1)50/π cm^2 2) $50\pi cm^2$ 3) 25π cm^2 4) $25/\pi cm^2$

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27. If there is an error of 0.01 cm in the diameter of a sphere when its radius 5cm, then the percentage error in its surface area is ____ (1986)
1)0.2 2) 0.6 3) 0.05 4) π/10

28. The length of a simple pendulum is decreased by 3% then percentage error in period T is ____ (1996)
1)2% 2) 2.5% 3) 1.8 % 4) -1.5%

29. The percentage error in measuring the side of a cube is 0.5. Percentage error in its volume is _____ (1996)
1)1/2 2) 1 3)3/2 4) 2

30. The approximate percentage reduction in the volume of a cube of ice if each side of ice cube is reduced by 0.7% due to melting is ____ (1996)
)2.1% 2) 2.5% 3) 3.2 % 4) 3.3%

31. The value of $(127)^{1/3}$ upto 4 decimal places is _____ (1998)
1)5.0267 2) 5.4267 3) 5.5267 4) 5.0001

32. In a cube the percentage increase in the side is 1. The percentage increase in volume of cube is __ (1999, 2000)
1)2 2)3 3)3/2 4)1/2

33. The approximate value of $(1.0002)^{3000}$ is (2002)
1)1.2 2)1.4 3)1.6 4)1.8

34. A stone thrown upwards, has its equation of motion $s=490t-4.9t^2$. then the Maximum height reached by it is (2005)
1)24500 2)125000 3)12250 4)2540

35. The circumference of a circle is measured as 56 cm with error 0.02 cm. The percentage error in its area is (2007)
1)1/7 2)1/28 3)1/14 4)1/56

42. There is an error of ± 0.04 cm in the measurement of the diameter of a sphere. When the radius is 10cm, the percentage error in the volume of the sphere is: (2009)

1) ±1.2 2) ±1.0 3) ±0.8 4) ±0.6

43. If the distance s travelled by a particle in time t is given by $s=t^2-2t+5$, then its acceleration is [2011]
1) 0 2) 1 3) 2 4) 3

38. If the volume of a sphere increases at the rate of $2\pi cm^3/\sec$, then the rate of increase of its radius (in cm/sec), when the volume is $288\pi cm^3$ is [2012]

1) $\frac{1}{36}$ 2) $\frac{1}{72}$ 3) $\frac{1}{18}$ 4) $\frac{1}{9}$

39. The relation between pressure p & volume v is given by $pv^{1/4}$ = constant. If the percentage decrease in volume is 1/2, then the percentage increase in pressure is [2013]

1) $-\frac{1}{8}$ 2) $\frac{1}{16}$ 3) $\frac{1}{8}$ 4) $\frac{1}{2}$

40. The focal length of a mirror is given by $\frac{2}{f}=\frac{1}{v}-\frac{1}{u}$ In finding the values of u & v, the errors are equal & equal to 'p'. Then, the relative error in f is [2013]

1) $\frac{p}{2}\left(\frac{1}{u}+\frac{1}{v}\right)$ 2) $p\left(\frac{1}{u}+\frac{1}{v}\right)$ 3) $\frac{p}{2}\left(\frac{1}{u}-\frac{1}{v}\right)$ 4) $p\left(\frac{1}{u}-\frac{1}{v}\right)$

41. If there is an error of ±0.04 cm in the measurement of the diameter of a sphere then the approximate percentage error in its volume, when the radius is 10cm, is (2014)

1) ±0.06 2) ±0.006 3) ±0.6 4) ±1.2

42. An Equilateral triangle is of side 10 units. In measuring the side, an error of 0.05 units is made. Then the percentage error in the area of the triangle is (2015)

1) 5 2) 4 3) 1 4) 0.5

43. The radius (in cms) of the right circular cylinder of greatest curved surface area which can be inscribed in a given cone with radius 10 cm is (2017AP)

1) $\frac{\pi}{5}$ 2) 5π 3) 20 4) 5

KEY

1) **3**	2) **4**	3) **1**	4) **1**	5) **1**	6) **4**	7) **3**	8) **2**	9) **1**	10) **3**
11) **1**	12) **2**	13) **2**	14) **2**	15) **2**	16) **3**	17) **1**	18) **2**	19) **4**	20) **1**
21) **2**	22) **3**	23) **2**	24) **3**	25) **1**	26) **1**	27) **1**	28) **4**	29) **3**	30) **1**
31) **1**	32) **2**	33) **3**	34) **4**	35)	36) **4**	37) **3**	38) **2**	39) **3**	40) **2**
41)	42) **1**	43) **4**	44)						

Exercise-B

1. If an error of 0.01 cm is made while measuring the radius 2 cm of a circle then the relative error the circumference is

1) 0.004 2) 0.4 3) 0.4 π 4) 0.6 π

2. If there is an error of 0.01 cm os made while measuring the radius 5 cm of a circle, then the percentage error in circumference is

1) 0.2 2) 0.02 3) 0.002 4) 0.0002

3. If the relative error in the radius of a circle is 0.2 then the relative error in its area is

1) 0.2 2) 0.1 3) 0.4 4) 0.3

4. A sphere of radius 10 cm shrinks to 9.8 cm then approximate decrease in its volume is

1) 8 π 2) 80 π 3) 0.4 π 4) 0.84 π

5. If there is an error 0.05 sq.com in the surface area of a sphere then the error in its volume when the radius = 20 cm is
1) 1 c.c 2) 0.5 c.c 3) 2.5 c.c 4) 1.5 c.c

6. If there is an error of 0.05 cm in the side of a cube 10 cm then the error in its surface area is
1) 6c.m^2 2) 12 c.m^2 3) 5 c.m^2 4) 3 c.m^2

7. If the error in the volume of a cube is 6% then the percentage error in the side of a cube is
1) 1 2) 2 3) 3 4) 4

8. If there is an error 0.01 cm in the measurement of the radius 10 cm of a cylinder of fixed height 20 cm then the error in volume, (cubic cm)
1) 4 π 2) 2.5 π 3) 0.06 4) 0.6

9. If errors of 1% each are made in the base radius & height of a cone, the percentage error in its volume is
1) 1 2) 2 3) 3 4) 4

10. Let P be the pressure & V the volume of a gas such that PV = constant. If percentage error in P is k then percentage error in V is
1) k 2) $\frac{1}{k}$ 3) –k 4) 2k

KEY

1) 3	2) 1	3) 3	4) 2	5) 2	6) 1	7) 2	8) 1	9) 3	10) 3

26. b) TANGENT AND NORMAL

1. Slope of tangent $m = \frac{dy}{dx}$
2. Equation of tangent at (x_1,y_1) is $y-y_1=m(x-x_1)$
3. Slope of normal $= -\frac{1}{m}$
4. Equation of normal at (x_1,y_1) is $y-y_1 = \frac{-1}{m}(x-x_1)$
5. If m_1 and m_2 are gradients of two curves then $\tan\theta = \frac{m_1-m_2}{1+m_1m_2}$
6. If two curves touch each other then $m_1=m_2$ or $\theta=0$ or $\theta=180^0$
7. If two curves are orthogonal to each other then $m_1m_2=-1$ or $\theta=90^0$
8. If two curves touch each other at P then the two curves have a common tangent and common normal at P.
9. Length of tangent $= \frac{y_1\sqrt{1+m^2}}{m}$
10. Length of normal $= y_1\sqrt{1+m^2}$
11. Length of sub tangent $= \left|\frac{y_1}{m}\right|$
12. Length of subnormal $= |y_1m|$
13. Equation of tangent at (x_1,y_1) to the curve $\left(\frac{x}{x_1}\right)^n+\left(\frac{y}{y_1}\right)^n=2$ is $\frac{x}{x_1}+\frac{y}{y_1}=2$.
14. If m is not defined then the tangent is $\perp$ to x-axis.
15. If m=0 then the tangent is $\parallel$ to x-axis at that point.
16. The area of right angle triangle formed by tangent at p, normal at P and x-axis is $\frac{y^2(1+m^2)}{2|m|}$ sq.units

EXERCISE-A

1. Slope of the curve $y = 3x^2-2x+7$ at (1,3) is _____
   1) 5 2) 8 3)4 4) -8

2. Slope of tangent to the curve $x^2+y^2=4$ at $(\sqrt{2}, \sqrt{2})$ is _____
   1) 0 2)1 3)-1 4)2

3. Slope of tangent to the curve $x=at^3$, $y = at^4$ at t=1 is _____
   1)4 2) 3 3) 4/3 4) 12

4. Slope of normal to the curve $y = \cos 2x$ at $x = \pi/6$ is _____
1)none 2) $\sqrt{3}$ 3)$1/\sqrt{3}$ 4) $2/\sqrt{3}$

5. Normal to a given curve is parallel to x – axis if _____
1)dy/dx=0 2) dy/dx=1 3) dx/dy=0 4) dx/dy=1

6. Equation of tangent to the curve $y = x^3+1$ at (1,2) is _____
1)x-3y-1=0 2) 3x-y-1=0 3) 3x+y-1=0 4) x+y-1=0

7. Equation of tangent to the curve $x^n + y^n = 2$ at (1,1) is _____
1)x-y=2 2) y-x=2 3) x+y=2 4)x+y=1

8. Equation of normal at (1,1) to the curve $x^n+y^n = 2$ is_____
1) x+y=2 2)x-y=0 3) y-x=2 4) y-x=0

9. Equation of tangent to the curve $(x/a)^n + (y/b)^n = 2$ at (a,b) on it is _____
1)x/a+y/b=1 2)x/a-y/b=1 3) x/a+y/b=2 4) x/a-y/b=2

10. Find equation of tangent to the curve $y = be^{-x/a}$ at the point where it crosses the y – axis.
1)x/a+y/b=1 2) x/a-y/b=1 3) y/b-x/a =1 4) ax-by=1

11. The line x/a +y/b =1 touches the curve $y = be^{-x/a}$ at the point _____
1)(0,0) 2) (0,a) 3) (0,b) 4) (b,0)

12. Equation of normal to the curve $(x/a)^{2/3} + (y/b)^{2/3} = 1$ at $(a\cos^3\theta, b\sin^3\theta)$ is _
1)$ax\cos\theta + by\sin\theta = a^2\cos^4\theta$ 2) $ax\cos\theta + by\sin\theta = \sin^4\theta$
3) $ax\cos\theta - by\sin\theta = a^2\cos^4\theta - b^2\sin^4\theta$ 4) n

13. Equation of tangent to the curve $4x^2 + 9y^2 = 40$ and having slope -2/9 is _
1)x+9y=10 2) 8x-9y=10 3) x+9y=20 4) 2x+9y±20=0

14. Equation of tangent to $9x^2 + 16y^2 = 52$ which is parallel to 9x-8y=1 is _
1)8x-9y=13 2) 8x-9y=26 3) 9x-8y±26=0 4) 9x-8y=13

15. Equation of tangent to $y=x^3+3x^2-5$ which is ⊥ to 2x-6y+1 =0 is _____
1) x-y+10=0 2) x+y-10 =0 3) 3x-y+6=0 4) 3x+y+6=0

16. Slope of tangent to xy+ax=2y at (1,1) is 2 then a =_____
1)1 2) 2 3)1 /2 4)-1

17. If slope of tangent to xy+ax=by at (1,1) is 2 then b=_____
1)2 2) (a+3) / 2 3) (a-3)/2 4) 3/2

18. If the equation of tangent at (2,3) on the curve $y = ax^2+b$ is $y = 4x-5$ then a =____
1) 1 2)2 3)3 4) -1

19. Equation of tangent to $(x/a)^{2/3} + (y/a)^{2/3}=1$ is _____
1)x/a +y/a=1 2) x/acosθ + y/asinθ=1 3) x/acosθ + y/ bsinθ=14) x/a+y/b=1

20. Length of tangent drawn at any point to $x^{2/3} +y^{2/3} = a^{2/3}$ which is intercepted between coordinate axes is =_____
1) a 2) a cos θ 3) a sinθ 4)a^2

21. Find the length of tangent, normal, sub tangent, subnormal at any point on the curve
x= a cos $^3\theta$, y= a $\sin^3 \theta$
1) $a\sin^2\theta$, a $\sin^3\theta\sec\theta$, $a\sin^2\theta \cos\theta$, a $\sin^4\theta\mathrm{Sec}\theta$ 2) $\sin^2\theta$, $\sin^3\theta \sin\theta$, $\sin^4\theta$
3) $\sin^2\theta$, $\sin^3\theta\sec\theta$, $\sin^2 \theta\cos\theta$,$\sin^4\theta\cos\theta$ 4) n

22. Find the length of sub tangent at any point to the curve x=a (cos t + log tan t/2) , y= a sin t
1)a cost 2) a sin t 3) a cot t 4) a

23. Sub tangent at any point on the parabola $y^2 = 4ax$ is proportional to ____
1) S.T α y^2 2) S.T α y^2
3)S.T α y3, S.N αabscissa 4) S.T α $1/y^3$ S.N α abscissa

24. In the curve $xy= a^2$ the S.T at any point is _____ S.N. is_____
1) S.T α abscissa, S.N αy^3 2) S.T α y^3, S.N α abscissa
3) S.T α$1/y^3$S.N α abscissa 4) none

25. For the curve $y = be^{-x/a}$ the S. T is _____ and S.N is _____
1)a,S.N α$(\text{ordinate})^2$ 2) ordinate , S.N α a^2
3) S.T α ordinate, S.N α a 4) S.T α a, S.N α a

26. If curves $lx^2+my^2 =1$ and $l^1 x^2+m^1 y^2=1$ intersect orthogonally then ll^1x^2/mm^1y^2=_____
1) 1 2) -1 3)-2 4)2

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27. $y=x^2$ and $6y = 7 –x^3$ intersect at (1,1) at an angle _____ (1982)
1) 45^0 2) 90^0 3) 60^0 4) 75^0

28. Equation of the tangent to the curve $y = 3x^3+6x^2-9$ at the point where the curve cuts y– axis is _____ (1982)
1) y+9=0 2) y-9=0 3) y+1 =0 4) y-1=0

29. Find n if S.N. at any point on the curve $xy^n = a^{n+1}$ is constant. (1983)
1)1 2)-1 3) 5 4) –2

30. Length of S.N. at x=a on the parabola $y^2 = 16x$ is _____ (1984)
1) 4 2) 6 3) 8 4) 1042.

31. Length of S.N at any Point on the curve $y^2=2px$ is _____ (1985)
1)P 2) 1/P 3) –P 4) $-1/P^2$

32. Equation of normal to the curve $x^2=4y$ at (1,2) on it is _____ (1986)
1) x-y-3=0 2) x-y+3=0 3)2 x+y-4=0 4) y-x-3=0

33. The curve $x^4-2xy^2+y^2+3x-3y=0$ cuts the x-axis at (0,0) at an angle __ (1990)
1)π/4 2) π/2 3) π/6 4) π/3

34. For the parabola $y^2= 4ax$, ratio of Sub tangent to abscissa is _____ (1994)
1) 1:1 2) 2:1 3)x:y 4) x^2:y

35. Slope of normal to the curve x= a (θ - sinθ), y = a (1-cos θ) at θ = π/2 is ____ (1996)
1)0 2)1 3)-1 4) 1/√2

36. Length of S.N at (-1,4) on $y = 4x^2$ is _____ (1997)
1)4 2) 16 3) 32 4) 8

37. Length of S.T at any point θ on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is_____ (1997)
1)a/sinθ 2) a sin θ/secθ 3) a|sinθ cosθ| 4) a $\sin^2$ θ |secθ|

38. If at any point on the curve y = f(x) the length of the subnormal is constant then the curve is _____ (1998)
1) Circle 2) ellipse 3) parabola 4) st.line

39. Equation of tangent to $y = x^3-2x+7$ at the point (1,6) is _____ (1999)
1)x-5+y=0 2) x-y+5=0 3) y-x+5=0 4) x+y+5=0

40. If the acute angle between xy =2 and $y^2=4x$ is θ then tan θ=_____ (1999)
1)1 2) 2 3) 3 4) 1/231.

41. Area of the triangle formed by the normal to the curve $x= e^{siny}$ at (1,0) with coordinate axes is _____ (2000)
1) 1 2) 1/2 3) ¼ 4)2

42. Angle between curves $y^2 =4x$ and $x^2=4y$ at (4,4) is _____ (2000)
1) Tan^{-1} (3) 2) Tan^{-1} (4) 3) Tan^{-1} (4/3) 4) Tan^{-1} (3/4)

43. Equation of tangent to the curve $6y = 7-x^3$ at (1,1) is _____ (2001)
1) x+y-3=0 2) x-y+3=0 3) x+2y-3=0 4) 2x-y-3=0

43. The family of curves in which sub tangent at any point to any curve is double the abscissa is _____ (2001)
1) $x=cy^2$ 2) $y=cx^2$ 3) $x^2=cy^2$ 4) y=cx

44. The family of curves in which sub tangent at any point to any curve is double the abscissa is _____ (2001)
1) $x=cy^2$ 2) $y=cx^2$ 3) $x^2=cy^2$ 4) y=cx

45. The two curves $x=y^2$ and $xy=a^3$ cut orthogonally at a point then a^2 =___ (2002)
1)1/3 2)1/2 3)2 4)3

46. The angle between the curves y=sinx and y=cosx is (2003)
1)$tan^{-1}2\sqrt{2}$ 2)$tan^{-1}3\sqrt{2}$ 3)$tan^{-1}3\sqrt{3}$ 4)$tan^{-1}5\sqrt{2}$

47. If θ is the angle between the curves xy=2 and $x^2 +4y=0$, then tanθ=___ (2006)
1)1 2)-1 3)2 4)3

48. The lengths of tangent, sub tangent, normal and subnormal for the curve $y = x^2 +x-1$ at (1,1) are A,B,C and D respectively, then their increasing order is (2007)
1)B,D,A,C 2)B,A,C,D 3)A,B,C,D 4)B,A,D,C

49. The length of the sub tangent at (2,2) to the curve$x^5 =2y^4$. (2008)
1)5/2 2)8/5 3)2/5 4)5/8

50. The angle between the curves $y^2=4x+4$ and $y^2=36(9-x)$ is (2008)
1)30^0 2)45^0 3)60^0 4)90^0

51. The equation of the normal to the curve $y^4=ax^3$ at (a,a) is (2008)
1)x+2y=3a 2)3x-4y+a=0 3)4x+3y=7a 4)4x-3y=0

52. The length of the sub tangent at any point (x_1, y_1) on the curve $y = 5^x$ is [2011]
1) $5^x{}_1$ 2) $y_1.5^x{}_1$ 3) $\log_e 5$ 4) $\frac{1}{\log_e 5}$

53. The coordinates of the point P on the curve $x = a(\theta + \sin\theta), y = a(1 - \cos\theta)$ where the tangent is inclined at an angle $\frac{\pi}{4}$ to the x-axis, are [2012]

1) $\left(a\left(\frac{\pi}{2} - 1\right), a\right)$ 2) $\left(a\left(\frac{\pi}{2} + 1\right), a\right)$ 3) $\left(a\frac{\pi}{2}, a\right)$ 4) (a, a)

54. If Δ is the area of the triangle formed by the positive x-axis & the normal & tangent to the circle $x^2 + y^2 = 4$ at $(1, \sqrt{3})$, then $\Delta =$ [2012]

1) $\frac{\sqrt{3}}{2}$ 2) $\sqrt{3}$ 3) $2\sqrt{3}$ 4) 6

55. If the curves $x^2+py^2=1$ & $qx^2+y^2=1$ are orthogonal to each other, then [2013]

1) $p - q = 2$ 2) $\frac{1}{p} - \frac{1}{q} = 2$ 3) $\frac{1}{p} + \frac{1}{q} = -2$ 4) $\frac{1}{p} + \frac{1}{q} = 2$

56. If the curves $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ & $\frac{x^2}{25} + \frac{y^2}{16} = 1$ cut each other orthogonally then $a^2 - b^2 =$ (2014)

1) 400 2) 75 3) 41 4) 9

57. If the lines y = -4x + b are tanget to the curve $y = \frac{1}{x}$, then b = (2015)

1) ± 4 2) ± 2 3) ± 1 4) ± 8

58. The slope of the tangent to the curve $y = \int_0^x \frac{dt}{1+t^3}$ at the point where x = 1 is (2015 A.P)

1) 1/4 2) 1/3 3) 1/2 4) 1

59. The condition that $f(x) = ax^3 + bx^2 + cx + d$ has no extreme value is (2014)

1) $b^2 = 4ac$ 2) $b^2 = 3ac$ 3) $v^2 < 3ac$ 4) $b^2 > 3ac$

60. Two particles P & Q located at the point with coordinates $P(t, t^3 - 16t - 3)$, $Q(t + 1, t^3 - 6t - 6)$ are moving in a plane. The minimum distance between them in their motion is (2015)

1) 1 2) 5 3) 169 4) 49

61. If $x^2 + y^2 = 25$, then $log_5\left[Max(3x + 4y)\right]$ is (2015 A.P.)

1) 2 2) 3 3) 4 4) 5

62. The length of the segment of the tangent line to the curve $x = a\cos^3 t, y = a\sin^3 t$ at any point on the curve cut off by the coordinate axes is (2016)

1) 4a 2) a 3) a^2 4) 2a

63. The area of the triangle by the positive x – axis, the tangent & normal to the curve $x^2 + y^2 = 16a^2$ at the point $\left(2\sqrt{2}a, 2\sqrt{2}a\right)$ is (2016)

1) a^2 2) $16a^2$ 3) $4a^2$ 4) $8a^2$

64. If the angle between the circle $x^2 + y^2 - 2x - 4y + c = 0$ & $x^2 + y^2 - 4x - 2y + 4 = 0$ is 60^0 then c is equal to (2016AP)

1) $\frac{3 \pm \sqrt{5}}{2}$ 2) $\frac{6 \pm \sqrt{5}}{2}$ 3) $\frac{9 \pm \sqrt{5}}{2}$ 4) $\frac{7 \pm \sqrt{5}}{2}$

65. The equation of tangent to the curve $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n = 2$ at the point (a, b) is (2017)

1) $\frac{x}{a} = -\frac{y}{b}$ 2) $\frac{x}{a} + \frac{y}{b} = 2$ 3) $\frac{x}{a} = \frac{y}{b}$ 4) $\frac{x}{a} + \frac{y}{b} = n$

66. If the line x + y + k = 0 is a normal to the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ then k = (2017)

1) $\pm\frac{\sqrt{5}}{13}$ 2) $\pm\frac{13}{\sqrt{5}}$ 3) $\pm\frac{13}{5}$ 4) $\pm\frac{5}{13}$

67. At any point for the curve $3y^2 = (x + 5)^3$, if ST represents the length of the sub-tangent & SN represents the length of the subnormal then $9(ST)^2 =$ (2017AP)

1) 8 SN 2) 8 SN / 3 3) 27 SN 4) $8\,(SN)^2$

68. Let a kind of bacteria grow following the function $f(t) = t^4$, t given in seconds. If the rate of growth of the bacteria after t_0 seconds is 4000/ second, then $t_0 =$ (2017AP)

1) 0 2) 10 3) 20 4) 30

69. The angle of intersection between the curves $y^2 + x^2 = a^2\sqrt{2}$ & $x^2 - y^2 = a^2$, is (2016AP)

1) $\frac{\pi}{3}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{6}$ 4) $\frac{\pi}{12}$

70. The equation of the common tangent drawn to the curves $y^2 = 8x$ & $xy = -1$ is (2016AP)

1) y = 2x + 1 2) 2y = x + 6 3) y = x + 2 4) 3y = 8x + 2

71. The angle between the curves $x^2 = 8y$ & $xy = 8$ is (2017)

1) $\tan^{-1}\left(\frac{-1}{3}\right)$ **2)** $\tan^{-1}(-3)$ 3) $\tan^{-1}\left(-\sqrt{3}\right)$ 4) $\tan^{-1}\left(\frac{-1}{\sqrt{3}}\right)$

72. If the slope of the tangent to the curve $y = ax^3 + bx + 4$ at (2, 14) is 21, then the values of a & b are respectively

1) 2, -3 2) 3, -2 3) -3, -2 4) 2, 3

KEY

1) 3	2) 3	3) 3	4) 3	5) 1	6) 2	7) 3	8) 2	9) 3	10) 1
11) 3	12) 3	13) 4	14) 3	15) 4	16) 1	17) 1	18) 1	19) 2	20) 1
21) 1	22) 1	23) 2	24) 1	25) 1	26) 2	27) 2	28) 1	29) 4	30) 3
31) 1	32) 3	33) 1	34) 2	35) 3	36) 3	37) 4	38) 3	39) 2	40) 3
41) 4	42) 3	43) 1	44) 1	45) 2	46) 1	47) 4	48) 4	49) 2	50) 4
51) 3	52) 4	53) 2	54) 3	55) 4	56) 4	57) 1	58) 3	59) 3	60) 1
61) 3	62) 2	63) 4	64) 4	65) 2	66) 2	67) 1	68) 2	69) 2	70) 3
71)	72) 2	73)	74)	75)	76)	77)	78)	79)	80)

AIEEE Problems

1. The normal to the curve $x = a\,(1+\cos\theta)$, $y = a\sin\theta$ at 'θ' always passes through the fixed point [2004]
   1) $(a, 0)$ 2) (a, a) 3) $(0, 0)$ 4) $(0, a)$

2. The normal to the curve $x = a\,(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$ at any point θ is such that [2005]
   1) it passes through the origin 2) it makes angle $\pi/2+\theta$ with the x-axis
   3) it passes through $(a\pi/2, -a)$ 4) it is at a constant distance from the origin

3. A function $y = f(x)$ has a second order derivative $f''(x) = 6(x-1)$. If its graph passes through the point (2, 1) and at that point the tangent to the graph is $y = 3x-5$, then the function is [2004]
   1) $(x-1)^2$ 2) $(x+1)^2$ 3) $(x+1)^3$ 4) $(x-1)^3$

KEY

1) 1	2) 4	3) 4

26. c) RATES

1. If s in the distance travelled by a particle in time t then v= $\frac{ds}{dt}$

2. Acceleration =a = $\frac{dv}{dt} = \frac{d^2s}{dt^2} = v\frac{dv}{ds}$

3. If v = 0 then particle is at rest.

4. If v > 0 then s increases.

5. If v < 0 then s decreases.

6. If a = 0 then v is maximum

7. If a > 0 then v increases.

8. If a < 0 then v decreases.

9. Angular velocity =ω= $\frac{d\theta}{dt}$ where θ is the angle made by the ray with x- axis.

10. Angular acceleration = $\frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}$

11. A particle attains maximum height then ds/dt=0

12. A particle attains maximum velocity then dv/dt=0

13. A particle changes its direction then ds/dt=0 and $d^2s/dt^2 \neq 0$.

Exercise-A

1. Distances s= $ae^t + be^{-t}$ then velocity =_____
   1) $ae^t - be^t$ 2) $ae^t - be^{-t}$ 3) $ae^{-t} + be^t$ 4) $ad^{-t} - be^t$

2. s= $10t - 7t^3$ then maximum velocity=_____
   1)5 2) 10 3) 15 4) 7

3. The radius of a circular plate is 3cm and is increasing at the rate of 0.1 cm/s. Find the rate of increase in area.
   1)0.3 π cm^2/sec 2) 3π cm^2/sec 3) 6π cm^2/sec 4) 0.6 π cm^2/sec

4. The radius of a sphere is 10cm and is increasing at the rate of 1cm/sec. Find the rate of increase in the surface area.
1) 8 πcm^2/sec 2) 20 π cm^2/sec 3) 40 πcm^2/sec 4) 80 π cm^2/sec

5. A gas folder contains 1000 c.feet of gas at a pressure of 5 pond /sq.inch. If the pressure increases at the rate of 0.05 pond/ sq.inch/hr, find the rate of decrease in its volume.
1)10 cubic ft/sec 2) 20 cubicft/sec 3) 40 cubic ft/sec 4) 80 cubic ft/sec

6. Displacement x and velocity v of a particle are connected as $a+bv^2=x^2$. Find acceleration.
1)x 2) x/b 3) x/bv 4) bv/x

7. The velocity of a particle is given by equation $v^2=s^2+4$. Find the acceleration 50 cm away from starting point.
1)5 cm/sec^2 2) 25cm/sec^2 3) 50cm/sec^2 4)75cm/sec^2

8. A kite 80 m high with 100 m of chord starts horizontally at the rate of 4m/sec. Find the rate at which the chord is being paid out.
1)2km/hr 2) 3km/hr 3) 2.4 m/sec 4) 4.2 m/sec

9. A man 6 feet high walks with a uniform speed of 3feet/sec away from a lamp 15 feet high. Find the rate at which the length of his shadow is increasing.
1)15ft/sec 2) 9ft/sec 3) 6ft/sec 4) 2ft/sec

10. The surface area of a sphere is increasing at the rate of 1 ft^2/sec. Find the rate of increase of its volume when radius is 3ft.
1)5 ft^3/sec 2) 0.5 ft^3/sec 3) 1.5 ft^3/sec 4) 2 ft^3/sec

11. At the point (2,5) on the curve $y = x^3-2x+1$ the gradient is increasing _____ times as fast as x.
1) 6 times 2) 12 times 3) 30 times 4) 10 times

12. At the pt (1,2) on $y =2x^3$ gradient is increasing _____ times as fast as x.
1)10 times 2) 8 times 3) 12 times 4) 6 times

13. If the rate of x^3-5x^2+5x+8 is twice the rate of change of x then x=_____
1)3, 1/3 2) 3,-1/3 3) -3,1/3 4) 2,1/2

14. A kite flying at a height h meter has r meter of string paid out at a time t sec. If the kite moves horizontally with constant velocity v m/sec then the rate at which the string is paid out is ___

1) $\sqrt{r^2-h^2}$ v m/sec 2) $\frac{v\sqrt{r^2-h^2}}{r}$ m/sec

3) $\frac{r\sqrt{r^2-h^2}}{v}$ m/sec 4) $\frac{\sqrt{r^2-h^2}}{rv}$ m/sec

15. The volume of a ball increases at 4πcc/sec. The rate of increase of radius when the volume is 288π cc is _____
1) 1/4π 2) 1/12π 3) 1/36 4) 1/9

16. The rate of decrease of $x^2/2 - 2x+5$ is twice the decrease of x then x=_____
1) 2 2) 3 3)4 4)1

17. The radius of the base and depth of a conical funnel are 20 and 40 cm. Water flows from the funnel at the rate 2.25 cc/sec. The rate at which the water level decreases when altitude in 30 cm is _____.
1)5/8π cm/sec 2) 1/100 π cm/sec 3) 5/12π cm/sec 4) 1/120π cm/sec

PREVIOUS EAMCET PROBLEMS

18. An inverted cone has a depth of 10cm and a base of radius 5cm. Water in poured into it at the rate of 1.5 cc/sec. The rate at which the water is rising when the depth in 4cm is___ (1989)
1)0.5 cm/sec 2) 5/π cm/sec 3) 3/8 π cm/sec 4) 5πcmcm/sec

19. A particle is projected vertically upward. Its height h at time 't' has the relation h = $60t- 16t^2$.The velocity at which it hits the ground is ___ (1995).
1)60 2) 30 3) 90 4) 180

20. For particle moving on a straight line it is observed that the distance x at time t is given by x= $6t-\frac{1}{2}t^2$ .The maximum velocity during the motion is ____ (1997)
1) 3 2) 6 3) 9 4)12

21. Each side of an equilateral triangle expands at the rate of 2 cm/sec. The rate of increase of its area when each side is 10cm is _____ (1995, 1998)
1)10√2 2) 10√3 3) 10 4) 5

22. A cylindrical vessel of radius 0.5m is filled with oil at the rate of 0.25π cubic meters/min.The rate at which the surface of the oil is increasing is (1999)
1)1 m/min 2)2m/min 3)5 m/min 4)1.25 m/min

23. The distance moved by the particle in time t is given by s= $t^3-12t^2+6t +8$. At the instant when its acceleration is zero the velocity is _____ (2000)
1)42 2) -42 3) 48 4) -48

24. Gas is being pumped into a spherical balloon at the rate of $30ft^3$/min then the rate at which the radius increases when it reaches the value 15ft is (2003)
1)1/30π ft/min 2)1/15πft/min 3)1/20 ft/min 401/25 ft/min

25. A particle moves along the curve $y=x^2+2x$.The point on the curve such that x and y coordinates of the particle change with same rate (2004)
1)(1,3) 2)(1/2,5/2) 3)(-1/2,-3/4) 4)(-1,-1)

26. A point is moving on $y=4-2x^2$. The x coordinate of the point is decreasing at the rate of 5 units per second then the rate at which y coordinate of the point is changing when the point is at (1,2) is (2004)
1) 5 units/sec 2)10 units/sec 3)15 units/sec 4)20 units/sec.

27. The radius of a circular plate is increasing at the rate of 0.01cm.sec when the radius is 12cm. Then the rates at which the area increases is (2005)
1)0.24 πsq.cm/sec 2)60 πsq.cm/sec 3)24 πsq.cm/sec 4)1.2 πsq.cm/sec

28. *A* variable triangle is inscribed in a circle of radius R. If the rate of change of a side is R times the rate of change of the opposite angle, then the opposite angle is
(1) $\pi/6$ (2) $\pi/4$ (3) $\pi/3$ (4) $\pi/2$
Hint : use a = 2R sin A

29. The side of a cube is equal to the diameter of a shape. If the side and radius increase at the same rate. Then the ratio of the rates of change of their surface area is
(1) $\pi:6$ (2) $2\pi:3$ (3) $3:2\pi$ (4) $3:\pi$

30. The rate of change of area of a square plate is equal to that of the rate of change of its perimeter the length of the side is
1) $2\,units$ 2) $3\,units$
3) $4\,units$ 4) $6\,units$
Hint :
$$\frac{d}{dt}=(area)=\frac{d}{dt}(perimeter)$$

31. A variable triangle ABC is inscribed in a circle of diameter x units. At a particular instant, the rate of change in side a is x/2 times the rate of change in its opposite angle A. Then A = (2010)
1) $\frac{\pi}{2}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{6}$

32. If the distance s travelled by a particle in time t is given by $s = t^2 - 2t + 5$, then its acceleration is [2011]

1) 0 2) 1 3) 2 4) 3

33. If the volume of a sphere increases at the rate of $2\pi cm^3$ / sec , then the rate of increase of its radius (in cm/sec), when the volume is $288\pi cm^3$ is [2012]

1) $\frac{1}{36}$ 2) $\frac{1}{72}$ 3) $\frac{1}{18}$ 4) $\frac{1}{9}$

KEY

1) **2**	2) **2**	3) **4**	4) **4**	5) **1**	6) **2**	7) **3**	8) **3**	9) **4**	10) **3**
11) **2**	12) **3**	13) **1**	14) **2**	15) **3**	16) **3**	17) **2**	18) **3**	19) **1**	20) **1**
21) **2**	22) **1**	23) **2**	24) **1**	25) **3**	26) **4**	27) **1**	28)**3**	29)**4**	30)**1**
31) **2**	**32) 3**	**33) 2**							

AIEEE PROBLEMS

1. A point on the parabola $y^2 = 18x$ at which the ordinate increases at twice the rate of the abscissa is [2004]
1) (2, 4) 2) (9/8, 9/2) 3) (–9/8, 9/2) 4) (2, –4)

KEY

1. 2

Exercise-B

1. If a particle moves along a line by s = $\sqrt{1+t}$ then its acceleration is proportional to ___ of its Velocity at the instant
1) Square 2) Cube 3) Double 4) Triple

2. A particle moves along a line by s = $\frac{t^3}{3} - 3t^2 + 8t$ then the distance travelled by the particle before it first comes to rest is
1) 20 2) 20/3 3) 3 4) 60

3. The side of cube increases at a uniform rate of 0.05 cm per sec. The rate of increase in the volume when the side is 10 cm, is
1) 5 cubic cm / sec 2) 6 cubic cm/sec
3) 10 cubic cm/sec 4) 15 cubic cm / sec

4. The volume of a sphere is increasing at the rate of 1200 c.c / sec. The rate of increase of its surface when the radius is 10 cm is
1) 120 sq.cm/sec 2) 240 sq.cm/sec
3) 200 sq.cm/sec 4) 500 sq. cm/sec

5. Water is flowing into cylindrical tank of radius 7ft at the rate of 22 c.ft/sec. Then the rate of change in the water level is

1) 7 ft/sec 2) 1/7 ft/sec 3) 2/7 ft/sec 4) 7/2 ft/sec

6. Water is being poured into the inverted conical vessel at the rate of 1.5 cubic meter per minute. Its depth is always equal to twice its radius. The level of water is rising at the rate of $\frac{3}{8\pi}$ meter per minute when its depth is

1) 1 mt 2) 2 mt 3) 3 mt 4) 4 mt

7. A Particle moves along the curve $y=x^2+2x$ such that x and y coordinates of the particle change with same rate is ___

1)(1,3) 2)(1/2,5/2) 3)(-1/2,-3/4) 4)(-1,-1)

8. A point on the parabola $y^2=18x$ at which the ordinate increases at twice the rate of abscissa ___

1)(2,4) 2)(9/8,9/2) 3)(-9/8,9/2) 4)(2,-4)

9. A: If radius of circular plate is 15cm and it increases at the rate of 0.025cm/sec then rate of increase in area is $0.75cm^2/sec$.

R: If r is radius and C is circumference then $dr/dt= \frac{1}{2\pi} dC/dt$

1)A is true but R is not correct explanation of A

2)A is true and R is correct explanation of A

3) A is false and R is true 4) none

10. The rate of change in volume and radius of sphere are equal then its radius is ____

1)1/r 2)$1/2\sqrt{\pi}$ 3) $1/r^2$ 4)$1/2\pi r$

KEY

1) **2**	2) **2**	3) **4**	4) **2**	5) **3**	6) **4**	7) **3**	8) **2**	9) **1**	10) **2**

26. d) Maxima and Minima

1. If $f'(x)>0$ then $f(x)$ is increasing.

2. If $f'(x)< 0$ then $f(x)$ is decreasing.

3. To find stationery point:
   a) Find $f'(x)$.
   b) Take $f'(x)=0$ and find value of x.
   c) Substitute x value in $f(x)$.
   d) If $x=a$ then stationery point=$(a, f(a))$

4. To find maxima or minima:
   a) Find $f'(x)$.
   b) Take $f'(x)=0$ and find values of x.
   c) Find $f''(x)$.
   d) Substitute x values in $f''(x)$.If it is positive then we get minima and if it is negative then we get maxima.
   e) To get maximum or minimum value substitute x values in $f(x)$.

5. If $f(x)$ is increasing function in $[a,b]$ then
   a) The minimum value of $f(x)$ is $f(a)$.
   b) The maximum value of $f(x)$ is $f(b)$.

6. If $f(x)$ is decreasing function in $[a,b]$ then
   a) The minimum value of $f(x)$ is $f(b)$.
   b) The maximum value of $f(x)$ is $f(a)$.

7. If sum of two positive numbers is k then for sum of their nth Powers to be minimum the numbers should be $k/2$, $k/2$.

8. If the product of two positive numbers is k then for their sum to be minimum the numbers should be $\sqrt{k}$, $\sqrt{k}$.

9. Out of all rectangles with a given perimeter the square has the maximum area.

10. Out of all rectangles, which can be inscribed in a circle the square has the maximum area.

11. Among all the triangles, which can be inscribed in a circle, the equilateral triangle has the greatest area.($A=h^2/\sqrt{3} =3\sqrt{3}r^2/4$)

Exercise-A

1. The set of values of 'x' for which $f(x) = 2x^3 - 9x^2 + 12x + 16$ is increasing is
   (1) $(-\infty, \infty)$ (2) $(1,2)$
   (3) $(-\infty,1) \cup (2,\infty)$ (4) $[1, 2]$

2. The function 3+sinx is _____ in $(\pi/2,\pi)$
   1)increasing 2) decreasing 3) oscillating 4) none

3. If $f(x) = x\log x - x$ is an increasing function in the interval
   (1) $(0,\infty)$ (2) $(0,1) \cup (1,2)$
   (3) $(1,\infty)$ (4) $(-\infty,\infty)$

4. The function f(x) = x^3-$6x^2$ +9x +1 is increasing in _____
   1)R 2) ϕ 3) (-2,6) 4) $(-\infty,1) \cup (3, \infty)$

5. The interval in which f(x) =x^3-$3x^2$-9x+20 is decreasing is _____
   1) ϕ 2) R 3) (-1,3) 4) (3,1)

6. The function xe^x is increasing in_____
   1) (-3,0) 2) (0,4) 3) $(-1,\infty)$ 4) $(1/e,\infty)$

7. The stationary points of the function f (x) = x^3-$9x^2$ +24x-12 are _____
   1)(1,2) 2) (3,1) 3) (2,8) ,(4,4) 4) (4,6)

8. Stationary point of x^2+ 16/x is _____
   1)(2,12) 2) (1,2) 3) (1,12) 4) (1,1)

9. The minimum value of $2x^3$-$3x^2$-12x+5 is_____
   1)-15 2) 18 3)2 4)1 5

10. Find the minimum or maximum value of the function f(x) = x^2+(250/ x)
    1) 75 2) 45 3) 55 4) 35

11. Find minimum value of f(x) =x^x [2000]
    1)e^{-1} 2) $e^{1/e}$ 3) $(1/e)^{1/e}$ 4) e

12. Find the maximum value of log x/x
    1) e 2) 2e 3) 1/2 e 4) 1/e

13. The sum of two positive numbers is 24. Find the numbers so that the sum of their squares is minimum.

1)12,12 2)1 2,10 3) 24,24 4) 24,20

14. The sum of the two Positive numbers is 12. The numbers so that the sum of the squares is minimum are _____.
1)12,12 2) 12,10 3) 6,10 4) 6,6

15. The sum of the two positive numbers is k. The numbers so that the sum of the squares is minimum are _____.
1)k/2, k 2) k/2,k/2 3) k,k 4) 2k,2k

16. Divide 64 into two parts such that the sum of the cubes of two parts is minimum.
1)32,30 2) 32,32 3) 40,42 4) 42,42

17. If the sum of two positive numbers is 20 then maximum value of their product is
1) 50 2) 100 3) 25 4) 80

(Note: If the product of two positive numbers is k then for their sum to be minimum the numbers should be $\sqrt{k}$, $\sqrt{k}$)

18. The product of two positive numbers is 100. Find the numbers if the sum is minimum.
1)8,8 2) 12,12 3) 10,10 4) 20,20

19. The product of two positive numbers is 25. Find the numbers so that their sum is minimum.
1)5,5 2) $\sqrt{5}$, $\sqrt{5}$ 3) 10,10 4) 1/5,1/5

20. If $xy=1$, $x>0$ then find the minimum value of $x+y$. (1986)
1)2 2)-2 3) 1 4)-1

21. If $xy=9$ and $x>0$ then find the minimum value of $x+y$
1)2 2)4 3) 6 4) 8

(Note: Out of all rectangles with a given perimeter the square has the maximum area)

22. Find the dimensions of the greatest rectangle whose perimeter is 40cm.
1)5,5 2)10,10 3) 15,15 4) 20,20

23. Find the maximum area of a rectangle whose perimeter is 24 ft.
1)24 sq.ft 2) 6 sq.ft 3) 36 sq.ft 4) 48 sq.ft

24. The difference between two numbers is 10. If the square of the greater exceeds the twice the square of smaller by maximum value then they are_____
1)15,15 2) 20,10 3) 30,20 4) 2,2

25. If sum of two positive numbers is 20 then the maximum value of their Product is
1)50 2) 100 3) 25 4) 80

(Note: Out of all rectangles, which can be inscribed in a circle the square has the maximum area.)

26. Find the maximum area of a rectangle, which can be inscribed in a circle of radius 5 cm.
1)5 2) 10 3) 25 4) 50

27. The maximum area of rectangle that can be inscribed in a circle of radius 7 is ___
1)7 2) 49/2 3) 49 4) 98

(Note: Among all the triangles, which can be inscribed in a circle, the equilateral triangle has the greatest area.)

28. Find the area of greatest triangle, which can be inscribed in a circle of radius 3cm. ($A=3\sqrt{3}r^2/4$)
1) $27\sqrt{3}/4$ 2) $18\sqrt{3}/4$ 3) $36\sqrt{3}/4$ 4) $81\sqrt{3}/4$

29. Find the area of greatest triangle, which can be inscribed in a circle of radius 4cm.
1) $12\sqrt{3}$ 2) $18\sqrt{3}$ 3) $36\sqrt{3}$ 4) $81\sqrt{3}$

30. The perimeter of a sector of a circle is constant. Find its area (to be maximum) if the angle of the sector is 2 radians.
1)P/8 2) $P^2/16$ 3) $P^2/8$ 4) P/16

31. The perimeter of a sector of a circle is 20cm. Find the angle of the sector for the area to be maximum.
1)1 radians. 2) 2 radians 3) 3 radians. 4) 4 radians

32. The perimeter of a sector of a circle is 8cm.Finf the maximum area.
1)2 sq.units 2) 4 sq.units 3) 6 sq. units 4) 1/2 sq.units

33. Find a and b if $y=a\log x+bx^2+x$ has the extreme values at x=-1 and x=2.
1) a=2, b=-1 2) a=2 b=-1/2 3) a=-2 b=1/2 4) a=-1.b=0

34. A quadratic function in x has the value 19 when x=1 and has a maximum value 20, when x=2. Find the function.
1)$x^2+4x+16$ 2)$x^2-4x+16$ 3)$-x^2+4x+16$ 4)$-x^2-4x+16$

35. Find a point on the parabola $y=x^2+4x+3$ which is closest to the line y=3x+2.
1)(1/2,21/4) 2)(-1/2,5/4) 3)(1/2,1/2) 4)(2,3/2)

PREVIOUS EAMCET PAPER PROBLEMS

36. The fuction x(x-1)(x-2) attains its maximum value when x is [1996]
1)1 2)$1+\frac{1}{\sqrt{3}}$ 3) $1-\frac{1}{\sqrt{3}}$ 4) $1\pm\sqrt{3}$

37. The minimux-1m value of x^2-8x+17, $x \in R$ is [1998]
1)17 2)-1 3)1 4)2

38. If x and y are strictly positive such that x+y =1, then the minimum value of xlogx+ylogy is [1998]
1)log2 2)-log2 3)2log2 4)0

39. The nearest point on the curve y^2 =4x to (2,1) is [1998]
1)(4,4) 2)(1,2) 3)(9,6) 4)(4,5)

40. If x+y=12 then minimum value of x^2+y^2 is [1999]
1)72 2)144 3)48 4)36

41. The minimum distance from the poinjt (4,2) to the parabola y^2 =8x is
1) $\sqrt{2}$ 2)2 $\sqrt{2}$ 3)3 $\sqrt{2}$ 4)4 $\sqrt{2}$

42. The maximum value of xy subject to x+y=7 is [2001]
1)12 2)10 3)49/4 4)55/4

43. The function f(x)=xe^{-x} attains a maximum value at x= [2002]
1)2 2)1/e 3)1 4)3

44. A minimum value of $\int_0^x te^{-t}dt$ is ____ (2003)
1)1 2)2 3)3 4)0

45. Observe the following statements: (2005)
A:f(x)=$2x^3$-$9x^2$+12x-3 is increasing outside the interval(1,2).
R:f'(x)<0 for x $\in$(1,2).
Then which of the following is true?
1)Both A and R are true and R is not correct reason for A
2)Both A and R are true and R is the correct reason for A
3)A is true but R is false 4)A is false but R is true

46. In the interval (-3,3) the function f(x)=x/3+3/x, x≠0 is: (2006)
1) increasing 2) decreasing
3) neither increasing nor decreasing 4) partly increasing and partly decreasing

47. The perimeter of a sector of circle is a constant. If its area is to be maximum, the sectorial angle is: (2006)
1)π^c/6 2)π^c/4 3)4^c 4) 2^c

48. The fuction f(x) =x/logx has minimum value at x =
1)3/2 2)e 3)-e 4)1

49. The condition for $f(x) - x^3+px^2+qx+r (x \in R)$ to have no extreme value,is (2007)
1)$p^2 < 3q$ 2)$2p^2 < q$ 3)$p^2 < 1q/4$ 4)$p^2 > 3q$

50. Observe the statement given below:
(A): $f(x) = xe^{-x}$ has maximum at $x = 1$
(R): $f'(1) = 0$ and $f''(1) < 0$.Which of the following is correct ? (2007)
1)Both are true ,and (R) is the correct reason for (A).
2)Both (A) and (R) are true, but (R) is not correct reason for (A).
3) (A)is true,(R) is false. 4) (A)is false,(R) is true.

51. If m and M respectively denote the minimum and maximum of $f(x)=(x-1)^2+3$ for $x \in [-3,1]$ then the ordered pair (m,M)= (2008)
1)(-3,19) 2)(3,19) 3)(-19,3) 4)(-19,-3)

52. The function $f(x) = x^3 + ax^2 + bx + c$, $a^2 \le 3b$ has: (2009)
1) one maximum value 2) one minimum value
3) no extreme value 4) one maximum and one minimum value

53. The maximum value of $\frac{\log x}{x}$, $0 < x < \infty$ is : (2009)
1) ∞ 2) e 3) 1 4) e^{-1}

54. The height of the cone of maximum volume inscribed in a sphere of radius R is : (2010)
1) $\frac{R}{3}$ 2) $\frac{2R}{3}$ 3) $\frac{4R}{3}$ 4) $\frac{4R}{\sqrt{3}}$

55. The longest distance of the point (a, 0) from the curve $2x^2 + y^2 = 2x$ is : (2010)
1) 1 + a 2) $|1-a|$ 3) $\sqrt{1-2a+2a^2}$ 4) $\sqrt{1-2a+3a^2}$

56. The condition that $f(x) = ax^3 + bx^2 + cx + d$ has no extreme value is (2014)
1) $b^2 = 4ac$ 2) $b^2 = 3ac$ 3) $v^2 < 3ac$ 4) $b^2 > 3ac$

57. Two particles P & Q located at the point with coordinates $P(t, t^3 - 16t - 3)$, $Q(t + 1, t^3 - 6t - 6)$ are moving in a plane. The minimum distance between them in their motion is (2015)
1) 1 2) 5 3) 169 4) 49

58. If $x^2 + y^2 = 25$, then $log_5\left[Max\left(3x+4y\right)\right]$ is (2015 A.P.)
1) 2 2) 3 3) 4 4) 5

59. Define $f(x)=\frac{1}{2}\left[|\sin x|+\sin x\right], 0<x\le 2\pi$. Then, f is (2016)

1) Increasing in $\left(\frac{\pi}{2},\frac{3\pi}{2}\right)$

2) Decreasing in $\left(0,\frac{\pi}{2}\right)$ & increasing in $\left(\frac{\pi}{2},\pi\right)$

3) Increasing in $\left(0,\frac{\pi}{2}\right)$ & decreasing in $\left(\frac{\pi}{2},\pi\right)$

4) Increasing in $\left(0,\frac{\pi}{4}\right)$ & decreasing $\left(\frac{\pi}{4},\pi\right)$

60. The smallest value of the constant m > 0 for which $f(x)=9mx-1+\frac{1}{x}\ge 0$ for all x > 0 is (2016)

1) $\frac{1}{9}$ 2) $\frac{1}{16}$ 3) $\frac{1}{36}$ 4) $\frac{1}{81}$

61. Suppose f(x) = x(x + 3)(x – 2), x ∈ [-1, 4]. Then a value of c in (-1, 4) satisfying $f'(c)=10$ is (2016AP)

1) 2 2) $\frac{5}{2}$ 3) 3 4) $\frac{7}{2}$

62. The local maximum of $y = x^3 - 3x^2 + 5$ is attained at (2017)

1) x = 0 2) x = 2 3) x = 1 4) x = -1

KEY

1) 3	2) 2	3) 3	4) 4	5) 3	6) 3	7) 3	8) 1	9) 1	10) 1
11) 3	12) 4	13) 1	14) 4	15) 2	16) 2	17) 2	18) 3	19) 1	20) 2
21) 3	22) 2	23) 3	24) 2	25) 2	26) 4	27) 4	28) 1	29) 1	30) 2
31) 2	32) 2	33) 2	34) 3	35) 2	36) 3	37) 3	38) 2	39) 2	40) 1
41) 2	42) 3	43) 3	44) 4	45) 2	46) 2	47) 4	48) 1	49) 1	50) 1
51) 2	52) 3	53) 4	54) 3	55) 3	56) 3	57) 1	58) 3	59)3	60)3
61) 1	62) 1	63)	64)	65)	66)	67)	68)		

Exercise-B

1. The minimum value of (x-a)(x-b) is

1) ab 2) $\frac{(a-b)^2}{4}$ 3) 0 4) $-\frac{(a-b)^2}{4}$

2. The minimum value of $3e^x + 4e^{-x}$ is

1) $4\sqrt{3}$ 2) $2\sqrt{3}$ 3) $3\sqrt{2}$ 4) 5

3. The function $f(x)=\sqrt{2x-x^2}$ increases in

1) (0, 1) 2) (-∞, 1) 3) (1, 2) 4) (0, 2)

4. The increasing function in $\left[0,\frac{\pi}{4}\right]$ is

1) cosx + sinx 2) cosx – sinx 3) $\frac{\sin x}{x}$ 4) $\frac{x}{\sin x}$

5. The minimum value of $2^{(x^2-3)^3+27}$ is

1) 2^{27} 2) 2 3) 1 4) 4

6. If $f(x) = ax^2 + bx^2 + cx + d$ has no extremum then a condition is

1) $b^2 \le 3ac$ 2) $b^2 < 3ac$ 3) $b^2 > 3ac$ 4) $b^2 \ge 3ac$

7. A box of maximum volume with open top is to be made out of a square tin sheet of side 6 ft in length by cutting out small equal squares from the four corners of the sheet then height of the box is

1) 2 2) 1 3) 1/2 4) 3/2

8. Area of the greatest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is

1) 2ab 2) ab 3) $\sqrt{ab}$ 4) 1/b

9. If the function $t=\frac{ax+b}{(x-4)(x-1)}$ has an extremum at P(2, -1), then the values of a & b are

1) a = 0, b = 1 2) a = 0, b = -1 3) a = 1, b = 0 4) a = -1, b = 0

10. The function $x^5 - 5x^4 + 5x^3 - 1$ is

1) Neither maximum nor minimum at x = 0 2) Maximum at x = 0
3) Maximum at x = 1 & minimum at x = 3 4) Minimum at x = 0

KEY

1) 4	2) 1	3) 1	4) 1	5) 3	6) 2	7) 1	8) 1	9) 3	10) 3

AIEEE PROBLEMS

1. The function $f(x) = Tan^{-1}(\sin x + \cos x)$ is an increasing function in [2007]

1) (π/4, π/2) 2) (–π/2, π/4) 3) (0, π/2) 4) (–π/2, π/2)

2. The function $f(x) = \frac{x}{2} + \frac{2}{x}$ has a local minimum at [2006]

1) $x = 0$ 2) $x = 1$ 3) $x = 2$ 4) $x = -2$

3. If x is real, the maximum value of $\frac{3x^2 + 9x + 17}{3x^2 + 9x + 7}$ is [2006]

1) 1 2) 17/7 3) 1/4 4) 41

4. If the function $f(x) = 2x^3 - 9ax^2 + 12a^2x + 1$ where $a > 0$ attains its maximum and minimum at p and q respectively such that $p^2 = q$ then then $a =$ [2003]

1) 3 2) 1 3) 2 4) 1/2

5. The real number x when added to its inverse gives the minimum value of the sum at $x =$ [2003]

1) 2 2) 1 3) –1 4) –2

6. A triangular park is enclosed on two sides by a fence and on the third side by a straight river bank. The two sides having fence are of same length x. The maximum area enclosed by the park is [2006]

1) $\frac{1}{2}x^2$ 2) πx^2 3) $\frac{3}{2}x^2$ 4) $\frac{\sqrt{x^3}}{8}$

KEY

1) 2	2) 3	3) 4	4) 3	5) 2	6) 1				

Additional Problems

APPLICATION OF DERIVATIVES

1. A Particle moves along the curve $y=x^2+2x$.The point on the curve such that x and y coordinates of the particle change with same rate is ___

1)(1,3) 2)(1/2,5/2) 3)(-1/2,-3/4) 4)(-1,-1)

2. A point on the parabola $y^2=18x$at which the ordinate increases at twice the rate of abscissa ___

1)(2,4) 2)(9/8,9/2) 3)(-9/8,9/2) 4)(2,-4)

3. A : A particle moves along a line is given by $s=t^3/3-3t^2+8t+5$. Its direction changes only when t=2,4

R: The direction of a body changes only when sign of velocity changes.

1)A,R are true and R is correct explanation of A.

2) A and R are true but R is not the explanation of A

3) A is true but R is false. 4) A is false but R is true.

4. A: If radius if circular plate is 15cm and it increases at the rate of 0.025cm/sec then rate of increase in area is $0.75cm^2/sec$.
R: If r is radius and C is circumference then dr/dt=1/2x dC/dt
1)A is true but R is not correct explanation of A
2)A is true and R is correct explanation of A
3) A is false and R is true 4) none

5. Match the following

I. If x+y=k then x^2+y^2 is minimum	a)125
II. If x+y=k then x^2y^3 is maximum when	b)x=y
III. The minimum value of 64secθ+27cosecθ When $\theta \in (0,\pi/2)$	c)x=8,y=12
IV. The greatest value of logx/x	d)e
	e)1/e

1)c,a,b,d 2)b,a,d,c 3)c,a,b,e 4)b,c,a,e

6. For the curve $y = ce^{\frac{x^2}{2}}$ the sub tangent varies inversely as the __
1) Ordinate 2) abscissa 3) cube of ordinate 4) square of ordinate.

7. The approximate value of $\sqrt[3]{123}$ is ___
1)4.96 2)3.86 3)2.96 4)5.96

8. The intervals in which $f(x)=-3+12x-9x^2+2x^3$ is decreasing
1)(2,1) 2)(1,2) 3)(2,-1) 4)(1,-2)

9. l,T are related as $T=2\pi\sqrt{l/g}$. If 'l' is reduced by 4% then percentage of decrease in T is __
1)1 2)3 3)2 4)0

10. A charge flowing through a conductor beginning with time t=0 is given by $\theta=2t^2+3t+1$ then the current intensity at the end of 5th second is ___
1)23.1.1 2)45 3)24 4)98

11. If we break up the number 8 into ten positive parts such that the sum of their cubes is the least Possible then the two particles are ____
1)(4,4) 2)(1,2) 3)(2,3) 4)(5,1)

12. The rate of change in volume and radius of sphere are equal then its radius is ____
1)1/r 2)$1/2\sqrt{\pi}$ 3) $1/r^2$ 4)$1/2\pi r$

13. At $p(x_1,y_1)$ on a curve if sub tangent and sub normal are equal then at that point the length of tangent is equal to ___
1)$\sqrt{2}y_1$ 2)$2y_2$ 3)$\sqrt{2}y_2$ 4) $\sqrt{y_1}$

14. If two curves $y=a^x$ and $y=b^x$ intersect at an angle α then $\tan\alpha$ equals to ___

1) $\frac{\log a - \log b}{1+\log a \log b}$ 2) $\frac{\log b - \log a}{1-\log a \log b}$ 3) $\frac{\log a + \log b}{1+\log a \log b}$ 4) $\frac{\log b + \log a}{1-\log a \log b}$

15. At any point on the curve $x^{2/3}+y^{2/3}=a^{2/3}$ the length of the tangent intercepted between the axes is

1)a 2)a/2 3)2a 4)3a/2

16. If x+y=12, then minimum value of x^2+y^2 is

1)72 2)144 3)36 4)18

17. If the line ax+by+c=0 is normal to xy=1 then

1)a>0,b<0 2)a>0,b>0 3)a>b=0 4)a<0,b<0

18. The minimum value of $(\sin x)^{\sin x}$ when $0<x<\pi$ is

1)$e^{1/e}$ 2)e^{-e} 3)$e^{-1/e}$ 4)43^{-1}

19. The approximate value of $f(x)=x^4-6x^3+13x^2-11x+4$ at x=2.01 is

1)2.01 2)2.31 3)2.21 4)2.12

20. An angle θ through which a pulley turns with true 't' is connected by $\theta=t^2+3t-5$ then the angular velocity for t=5 sec is

1)5c/sec 2)13 c/sec 3)23c/sec 4)35c/sec

21. A particle P moves along a straight line away from a fixed point 0 obeying the relation

$S=16+48t-t^3$ the direction of P at t=4 is

1) OP 2) PO 3) rest at the instant 4)1/2 to OP

22. The point on the parabola $y=x^2+7x+2$ which is closest to the straight line y=3x-3 is

1)(-1,-4) 2)(-2,-8) 3)(1,10) 4)(0,2)

23. The displacement s of a particle at time $t(0<t<\pi)$ is given by S=3sin2t-6cot.

Then the acceleration for the values of t for which its velocity is zero is

1)0 unit/sec^2 2)3 units/sec^2 3)2 units/sec^2 4)4 units/sec^2

24. The line x/a+y/b=1 is a tangent line to $y=be^{-x/a}$ at

1) (b/a,-a) 2) (-a,b/a) 3)(a/b,-b) 4)(0,b)

25. the slope of the normal at $\theta=\pi/2$ to the curve $x=a(\theta-\sin\theta)$ $y=a(1-\cos\theta)$ is

1)0 2)1 3)-1 4)$4\sqrt{2}$

26. For the curve $x=t^2-1, y=t^2-t$ the tangent line is perpendicular to x-axis then

1) t=0 2)$t^{-1}=0$ 3)$t=1/\sqrt{3}$ 4)$t=-1/\sqrt{3}$

27. The ratio between sub tangent and Abscissa of any point on the curve $y^2=4ax$ is

1)1:1 2)2:1 3)1:2 4)4n=2y

28. The equation of the tangent at (1,6) to the curve x3-y-2x=7 is

1)y=x+5 2)x+y=7 3)2x+y=8 4)x+2y=13

29. The angle between the curves $y^2=x$ and $x^2=y$ at (1,1)is

1)$\tan^{-1}(3/4)$ 2)$\tan^{-1}(2)$ 3)$\tan^{-1}(1)$ 4)$\tan^{-1}\pi/3$

30. the curve $y=xe^x$ has

1)minimum value at x=-1 2)maximum value at x=0

3)maximum value at x=-1 4)maximum value at x=0

KEY

1) 3	2) 2	3) 1	4) 1	5) 4	6) 2	7) 1	8) 2	9) 3	10) 1
11) 1	12) 2	13) 1	14) 1	15) 1	16) 1	17) 1	18) 3	19) 1	20) 2
21) 3	22) 2	23) 1	24) 4	25) 1	26) 1	27) 2	28) 1	29) 1	30) 1

e) MEAN VALUE THEOREM

Rolle's Theorem

Suppose a, b (a < b) are two real numbers. Let f: [a, b] → R be a function satisfying the following conditions:

i) f is continuous on [a, b]

ii) f is differentiable on (a, b) &

iii) f(a) = f(b)

Then $\exists$ at least one $c \in (a,b)$ such that $f'(c) = 0$

Lagrange's Mean Value Theorem

Suppose a, b (a <b) are two real numbers. Let f: [a, b] → R be a function satisfying the following conditions

i) f is continuous on [a, b]

ii) f is differentiable in (a, b)

Then there exists at least one point $c \in (a,b)$ such that $f'(c) = \dfrac{f(b) - f(a)}{b - a}$

Cauchy's mean value theorem: If f: [a, b] → R, g: [a, b] → R are such that

i) f, g are continuous on [a, b]

ii) f, g are derivable on (a, b) &

iii) $g'(x) \neq 0$ $g'(x) \neq 0, \forall x \in (a,b)$ then there exists $c \in (a,b)$ such that

$$\frac{f(b) - f(a)}{g(b) - g(a)} = \frac{f'(c)}{g'(c)}$$

LEVEL – I

1. If f(x) = sinx – sin2x on [0, π] then by Rolle's theorem c =

   1) $cos^{-1}\left(\dfrac{1 \pm \sqrt{33}}{8}\right)$ 2) $sin^{-1}\left(\dfrac{1 \pm \sqrt{33}}{8}\right)$

   3) $tan^{-1}\left(\dfrac{1 \pm \sqrt{33}}{8}\right)$ 4) $cot^{-1}\left(\dfrac{1 \pm \sqrt{33}}{8}\right)$

2. Verify Rolle's theorem for the function y = f(x) = x^2 + 4 in [-3, 3]

   1) 1 2) 0 3) -1 4) 2

3. Verify Rolle's thorem for the function f(x) = x(x + 3) $e^{-x/2}$ in [-3, 0]

   1) 2, 3 2) 3, 3 3) -2, 3 4) 3, 3

4. The constant c of Rolle's theorem for the function f(x) = $2x^3 + x^2 - 4x - 2$ in $\left[-\sqrt{2}, \sqrt{2}\right]$ is

   1) 0 2) 1 3)1/2 4) 2/3

5. The constant c of Rolle's theorem for the function f(x) = (x – a)(x – b) in [a, b] is

   1) $\sqrt{ab}$ 2) $\dfrac{a+b}{2}$ 3) $\dfrac{a-b}{2}$ 4) $\dfrac{b-a}{2}$

6. The constant c of Rolle's theorem for the f(x) = sinx in [0, 2π]is

   1) π / 6 2) π / 2 3) π / 4 4) π / 2

7. If 2a + 3b + 6c = 0, then at least one root of the equation $ax^2 + bx + c = 0$ lies in the interval
1) (0, 1) 2) (1, 3) 3) (2, 3) 4) (-1, 0)

8. Rolle's theorem cannot applicable for
1) $f(x) = x^3 - 6x^2 + 11x - 6$ in [1, 3] 2) f(x) = sinx in [0, π]
3) $f(x) = 1 - (x - 1)^{2/3}$ in [0, 2] 4) $f(x) = x^2 - 3x + 2$ in [1, 2]

9. The constant c of the Lagrange's mean value theorem for the function $f(x) = 1 + x^2$ on [1, 2] is
1) 5/4 2) 3/2 3) 7/4 4) 9/8

10. The constant c of Lagrange's mean value theorem for f(x) = 2sinx + sin2x in [0, π] is
1) π / 6 2) π / 4 3) π / 3 4) π / 2

KEY

1) 1	2) 2	3) 3	4) 4	5) 2	6) 4	7) 1	8) 3	9) 2	10) 3

PREVIOUS EAMCET QUESTIONS

1. The value of c in the Lagrange's mean – value theorem for $f(x) = \sqrt{x-2}$ in the interval [2, 6] is (2014)
1) $\frac{5}{2}$ 2) 3 3) 4 4) $\frac{9}{2}$

2. Define $f(x)\begin{cases} x & (0 \le x \le 1) \\ 2-x & (1 \le x \le 2) \end{cases}$ then Rolle's theorem is not applicable to f(x) because (2015)
1) f(x) is not defined everywhere on [0, 2] 2) f(x) is not continuous on [0, 2]
3) f(x) is not differential to (1, 2) 4) f(x) is not differentiable on (0, 2)

3. If f is defined in [1, 3] by $f(x) = x^3 + bx^2 + ax$, such that f(1) – f(3) = 0 & $f'(c) = 0$ where $c = 2 + \frac{1}{\sqrt{3}}$ then (a, b) (2015 A.P.)
1) (-6, 11) 2) $\left(2 - \frac{1}{\sqrt{3}}, 2 + \frac{1}{\sqrt{3}}\right)$ 3) (11, -6) 4) (6, 11)

4. The value of c for which the Lagrange's mean value theorem is applicable for the function f(x) = x(x + 3)(x – 2) in [-1, 4] is (2017AP)
1) 4/3 2) 8/3 3) 2 4) -8/3

KEY

1) 2	2) 4	3) 3	4) 3	5)	6)	7)	8)	9)	10)

II YEAR

1, 2. COMPLEX NUMBERS, DEMOIVRE'S THEOREM AND TRIGONOMETRIC EXPAANSIONS

1. A number of the form a+ib is called a complex number where a is real part and b is imaginary part.

2. a+ib and a-ib are called conjugate complex numbers. If z=a+ib then $\bar{z}$ =a-ib

3. Sum and product of two conjugate complex numbers is a real. $z+\bar{z}$ and $z\bar{z}$ are real.

4. x-axis $\rightarrow$ real axis
   y-axis $\rightarrow$imaginary axis
   plane – argand or complex plane

5. $|z| = \sqrt{a^2+b^2}$

6. $z\bar{z} = |z|^2$

7. $|z_1+z_2| \leq |z_1|+|z_2|$
   $|z_1-z_2| \geq |z_1| - |z_2|$
   $|z_1 . z_2| = |z_1||z_2|$
   $|z_1/z_2| = |z_1|/|z_2|$

8. $1, \omega = \frac{-1+i\sqrt{3}}{2}, \omega^2 = \frac{-1-i\sqrt{3}}{2}$ are cube roots of unity.

9. $\omega^3=1, 1+\omega+\omega^2=0$

10. Solution of equation $x^n-1=0$ is called nth roots of unity.

11. The sum of nth root of unity is 0 and product of nth roots of unity is $(-1)^{n-1}$.

12. n^{th} roots of unity are in G.P ($1,\omega,\omega^2$ are in G.P.)

13. $\cos\theta = x/r, \sin\theta=y/r$
    $\theta = \tan^{-1}(y/x)$ is called amplitude or argument
    If z=x+iy then argz= $\tan^{-1}(y/x)$ and ampz = $\tan^{-1}(y/x)$

14. $\sin x = (e^{ix}-e^{-ix})/2i$, $\cos x = (e^{ix} + e^{-ix})/2$ and $e^{ix} = \cos x + i\sin x$, $e^{-ix} = \cos x - i\sin x$

15. amp (z_1z_2) = ampz_1+ ampz_2
amp (z_1/z_2) = ampz_1-ampz_2
Argz^n =n Arg$z$

16. POLAR FORM or MOD-AMP FORM
If r is the modulus and θ is the argument of a complex number z then
Z= r (cos θ +i sin θ) which is called polar form or mod-amplitude form.
$\sqrt{3}+i = 2(\cos 30^0 + i\sin 30^0)$
$1+i = \sqrt{2}(\cos 45^0 + i\sin 45^0)$
$x+iy=r(\cos\theta + i\sin\theta)$

17. If amp of a complex number is π/4 then real part = imaginary part

18. $(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$

19. If $x = \cos\theta + i\sin\theta$ then
$x+\underline{1} = 2\cos\theta$, $x-1/x = 2i\sin\theta$
$x^n+(1/x^n) = 2\cos n\theta$, $x^n-(1/x^n) = 2i\sin n\theta$

20. If cos A +cos B + cos C= sinA + Sin B + sin C =0 then
a) cos 3A + cos 3B +cos 3C = 3 cos (A+B+C)
b) sin 3A +sin 3B+ sin 3C = 3 sin(A+B+C)
c) $\cos^2A + \cos^2B + \cos^2C=3/2$
d) $\sin^2A + \sin^2 B + \sin^2C=3/2$

21. Cube root of any real number 'a' are $a^{1/3}$, $a^{1/3}\omega$, $a^{1/3}\omega^2$

22. If $x^2=1$ then x=1,-1
If $x^3=1$ then $x=1,\omega,\omega^2$
If $x^4=1$ then x=-1,1,i,-i

23. If z=x+iy then $\sqrt{x+iy} = \pm\left[\sqrt{\frac{|z|+x}{2}} + \sqrt{\frac{|z|-x}{2}}\right]$

Shortcut to find square root:
Ex: 1) $\sqrt{-5+12i} = \sqrt{-5+2(6)i}$
Make the factors for 6 as 2 and 3
Take $2^2 - 3^2$ which is equal to 1st term -5

Hence $\sqrt{-5+12i} = 2+3i$

Ex: 2) $\sqrt{-8-6i} = \sqrt{-8+2(3)i}$

Make the factors for 3 as 3 and 1

Take -3^2+1^2 which is equal to 1st term -8

Hence $\sqrt{-8-6i} = 1\text{-}3i$

Ex: 3) $\sqrt{15-8i} = \sqrt{15-2(4)i}$

Make the factors for 4 as 4 and 1

Take $4^2 - 1^2$ which is equal to 1st term 15

Hence $\sqrt{15-8i} = 4\text{-}i$

24. $(1+i)^n+(1-i)^n = 2^{\frac{n}{2}+1} \cos n\pi/4$

25. $(1+i\sqrt{3})^n+(1-i\sqrt{3})^n=2^{n+1}\cos n\pi/3$

$(a+ib)^n+(a-ib)^n=2(\sqrt{a^2+b^2})^n \overline{\cos(n}\tan^{-1}b/a)$

26. Arg $Z=\tan^{-1}(y/x)+\pi$ if $x<0, y\geq 0$

Arg $Z=\tan^{-1}(y/x)-\pi$ if $x<0, y<0$

Arg $Z=\tan^{-1}(y/x)$ if $x>0, y\in R$

27. Multiplication inverse of $x+iy$ is $(x-iy)/x^2+y^2$.

28. $\cos n\theta=\cos^n\theta-nc_2\cos^{n-2}\theta\sin^2\theta+c_4\cos^{n-4}\theta\sin^4\theta-\ldots\ldots\ldots$

29. $\sin n\theta=nc_1\cos^{n-1}\theta\sin\theta-nc_3\cos^{n-3}\theta\sin^3\theta+nc_5\cos^{n-5}\theta\sin^5\theta-\ldots\ldots\ldots\ldots$

30. $$\tan n\theta = \frac{nc_1 \tan\theta - nc_3 \tan^3\theta + nc_5 \tan^5\theta - \ldots\ldots}{1 - nc_2 \tan^2\theta + nc_4 \tan^4\theta _ \ldots\ldots\ldots\ldots}$$

31. If n is even

$$\cos^n\theta = \frac{1}{2^{n-1}}\left[nc_0 \cos n\theta + nc_1 \cos(n-2)\theta + nc_2 \cos(n-4)\theta + \ldots\ldots + \frac{1}{2} nc_{\frac{n}{2}}\right]$$

32. If n is odd

$$\cos^n\theta = \frac{1}{2^{n-1}}\left[nc_0 \cos n\theta + nc_1 \cos(n-2)\theta + nc_2 \cos(n-4)\theta + \ldots\ldots + nc_{n-\frac{1}{2}} \cos\theta\right]$$

33. If n is even

$$\sin^n\theta = \frac{1}{(-1)^{\frac{n}{2}}2^{n-1}}\left[nc_0\cos n\theta - nc_1\cos(n-2)\theta + nc_2\cos(n-4)\theta - ..... + \frac{1}{2}(-1)^{\frac{n}{2}}nc_{\frac{n}{2}}\right]$$

If n is odd

$$\sin^n\theta = \frac{1}{(-1)^{\frac{n-1}{2}}2^{n-1}}\left[nc_0\sin n\theta - nc_1\sin(n-2)\theta + nc_2\sin(n-4)\theta - ..... + (-1)^{\frac{n-1}{2}}\frac{1}{2}nc_{\frac{n}{2}}\sin\theta\right]$$

34. $\frac{1}{\omega} = \omega^2$ and $\left|\frac{1}{\omega}\right| = 1$

35. $\frac{1}{\omega^2} = \omega$ and $\left|\frac{1}{\omega^2}\right| = 1$

36. $(1+\omega)(1+\omega^2)(1+\omega^4)(1+\omega^8)---2n$ factors =1

37. $|\omega| = 1$

38. $|\omega^2| = 1$

Exercise-A

1. Square root of (-8-6i) is _____
   1) $\pm$ (1-3i) 2) 1+3i 3) $\overline{1+9i}$ 4) – (1-3i)

2. Square root of 5+12i is ____
   1) $\pm$ (3-2i) 2)3+2i 3)$\pm$(3+2i) 4)9+4i

3. Square root of 5-12i is ___
   1) 3-2i 2) -3+2i 3) $\pm$ (3+2i) 4) $\pm$ (3-2i)

4. $\sqrt{4+3\sqrt{-20}} + \sqrt{4-3\sqrt{-20}} =$
   1)2 2)3 3)5 4) 6

5. Area of Δ formed by z, z+iz, iz is 100 sq.units then |z| =____
   1)2 2) 1 3) 10√2 4) 5√2

6. Conjugate of $\frac{2-i}{(1-2i)^2}$ is
   1)2+i 2) (-2/25) + (11i/25) 3) (-2/25) – (11i/25) 4) 1+2i

7. Least +ve integer n such that i^n=1 is ____

1) 4 2) 0 3) doesn't exist 4) 2

8. $(1+i)^{100} + (1-i)^{100}$ =_____
1) 2^{51} 2) 2^{50} 3) -2^{51} 4) -2^{50}

9. $(1+i)^{200} + (1-i)^{200}$=____
1) 2^{101} 2) -2^{101} 3) 2^{100} 4) -2^{100}

10. $(1+i)^{4n+1} + (1-i)^{4n+1}$ =__
1) 0 2) 1 3) $2^{n+1/2}$ 4) $2^{2n+3/2}\cos(4n+1)\pi/4$

11. $(1+i\sqrt{3})^{27} + (1-i\sqrt{3})^{27}$=_____
1) 2^{28} 2) -2^{28} 3) 2^{14} 4) -2^{14}

12. $(1+i)\ (1-i)^3$=_____
1) -4 2) 4 3) -4i 4) 4i

13. The conjugate of (3+4i) (2-3i) is ____
1) 18 –i 2) 18 +i 3) 1+18i 4) 1-18i

14. If the complex number z satisfies $z^2+z^{-2}=2$ then locus of z is ___
1) st.line 2) circle 3) parabola 4) hyperbola

15. logi =_____
1)$\pi/2$ 2) $i\pi/2$ 3) $\pi/3$ 4) $i\pi/3$

16. If $(1+i)^{100} = 2^{49}$ (x+iy) then x^2+y^2=___
1) 16 2) 8 3) 4 4) 2

17. If $(\sqrt{3}+i)^{100} = 2^{99}$ (a+ib) then a^2+b^2 =___
1)4 2) -4 3) 2 4) -2

18. Amp of complex number 0 is _____
1) 1 2) 0 3) ∞ 4) undefined

Note: $\theta = \tan^{-1}(y/x)-\prod$ if $x < 0, y < 0$
$\theta = \tan^{-1}(y/x) + \prod$ if $x<0, y>0$.

19. Amp $(1+i\sqrt{3}) / (\sqrt{3}-i)$
1) 30^0 2) 60^0 3) 90^0 4) 0^0

20. Amp of $-1-\sqrt{3}i$ is ___
1)$\pi/3$ 2) $2\pi/3$ 3) $-2\pi/3$ 4) $-\pi$

21. Amp (-1+i) =____
1)2π 2) $3\pi/4$ 3) $\pi/4$ 4) $-\pi/4$

22. Multiplicative inverse of 7+24i is _____
1)7-24i 2) (7-24i) /625 3) (24-7i) / 625 4) (24+7i) / 625

23. If z= 2-3i then z^2-4z+4 =____
1)-9 2) 9 3) -13 4) 13

24. If the real part of (z-4) / (z-2i) is 0 then locus of z is ____
1)$x^2+y^2-4x-2y=0$ 2) $x^2+y^2+4x+2y=0$ 3) $x^2+y^2-4x+2y=0$ 4) $x^2+y^2+4x-2y=0$

25. Mod-amp form of 1+i tanθ is _____
1)cisθ 2) cis sinθ 3)cis (θ sec θ) 4) cis 90^0

26. If Z= cos 15^0 + i sin 15^0 then $(z^8-1) / (z^8+1)$=____
1) $\sqrt{3}$ 2) $i\sqrt{3}$ 3) $-i\sqrt{3}$ 4) $-\sqrt{3}$

27. Mod – amp form of sin θ - i cos θ is ____
1) cis θ 2) cis (π/2+θ) 3) –cis (π/2+θ) 4) –cis (π/2-θ)

28. $(-1+i\sqrt{3})^{30} + (-1-i\sqrt{3})^{30}$ =____
1) 2^{31} 2) 2^{30} 3) -2^{30} 4) -2^{31}

29. $(a+ib)^{m/n} + (a-ib)^{m/n}$ =____

1) $2(\sqrt{a^2+b^2})^{m/n}$ cos (m/n) $\tan^{-1}$ (b/a) 2) $2(\sqrt{a^2+b^2})^{m/n}$
3) cos (m/n) 4) $\tan^{-1}$ (b/a)

30. If α and β are the roots of Q.E. $x^2-2x+2=0$ then $\alpha^n + \beta^n$=___
1) $2^{n/2}$ cos (nπ/4) 2) $2^{n/2+1}$ cos (nπ/4) 3) $2^{n/2-1}$cosnπ/4 4) 2^ncos(nπ/4)

31. If α and β are roots of Q.E. $x^2-2x+4=0$ then $\alpha^n+\beta^n$=____
1) 2^n cos (nπ/3) 2) 2^{n+2} 3) cos (n π/3) 3) 2^{n-1} cos (nπ/3) 4) 2^{n+1} cos (nπ/3)

32. If α and β are complex cube roots of unity then Q.E whose roots are α and β is __
1) $x^2+x+1=0$ 2) $x^2-x+1=0$ 3) $x^2+x-1=0$ 4) $x^2-x-1=0$

33. If $(1-\sqrt{3}i)$ is a root of the equation $x^2+px+q=0$ where p and q are real then (-p, q)=___
1) (4,2) 2) (-2,-4) 3) (2,4) 4) (-4,-2)

34. $i^{654} + i^{48} + \frac{1}{i^{126}} =$_____

1) 1 2) -1 3)2 4)-2

35. Solve $(x+1)^3=8$

1) $1,2\omega, 2\omega^2$ 2) $1,2\omega,\omega^2$ $1,\omega,\omega^2$ 3) $1, 2\omega-1, 2\omega^2-1$ 4) $1,2\omega,2\omega^2+1$

36. $(x-2)^3 + 27=0$

1) $1,2-\omega, 2-\omega^2$ 2) $-1,2-3\omega, 2-3\omega^2$ 3) $1,2-3\omega, 2-3\omega^2$ 4) $-1,-2-\omega, -2-3\omega^2$

37. $(x-1)^3 +8 =0$

1) $-1,1-2\omega,1-2\omega^2$ 2) $1,2\omega,2\omega^2$ 3) $1,1+2\omega, 1+2\omega^2$ 4) $-1,-1+2\omega-1+2\omega^2$

38. $\cos 4\theta =$____

1) $8\cos^4\theta - 8\cos^2\theta+1$ 2) $8\cos^2\theta-8\cos^4\theta+1$

3) $8\cos^4\theta-8\cos^2\theta-1$ 4) $8\cos^4\theta+8\cos^2+1$

39. $\sin 5\theta=$_____

1) $16\sin^5\theta - 20\sin^3\theta + 5\sin\theta$ 2) $16\sin^5\theta$ 3) $20\sin^3\theta$ 4) $5\sin\theta$

40. $\tan 4\theta=$_____

1) $4\tan\theta - 4\tan^3\theta$ 2) $\frac{4\tan\theta - 4\tan^3\theta}{1-6\tan^2\theta+\tan^4\theta}$ 3) $\frac{1-6\tan^2\theta+\tan^4\theta}{4\tan\theta+4\tan^3\theta}$ 4) none

41. $\cos^6\theta=$____

1) $\cos 6\theta + 6\cos4\theta+15\cos2\theta$ 2) $1/2^5$ $[\cos6\theta + 6\cos4\theta + 15\cos2\theta+10]$

3) $1/2^5$ ` 4) $1/2^5$ $[\cos6\theta+\cos 4\theta]$

42. $\cos^4\theta=$___

1) $1/8\ [\cos 4\theta+4\cos2\theta+3]$ 2) $\cos4\theta+4\cos2\theta+3$

3) $\frac{1}{2}\ [\cos4\theta+4\cos2\theta+3]$ 4) $1/4[\cos4\theta+4\cos\theta+3]$

43. $\cos^5\theta=$____

1) $(1/6)\ [\cos5\theta + 5\cos3\theta+10\cos\theta]$ 2) $(1/12)\ [\cos5\theta+\cos3\theta]$

3) $(1/16)[\cos4\theta+4\cos2\theta+3]$ 4) $\frac{1}{4}\ [\cos4\theta+4\cos\theta+3]$

44. $\sin^6\theta=$_____

1) $-1/32$ 2) $-1/32\ [\cos 6\theta-6\cos4\theta+ 15\cos2\theta-10]$

3) $-1/16\ [\cos\theta-6\cos4\theta+15\cos2\theta-10]$ 4) $-1/16$

45. $\sin^7\theta=$_____

1) $-1/64\ [\sin 7\theta- 7\sin 5\theta+21\sin 3\theta-35\sin\theta]$ 2) $-1/64$ 3) $-1/32\sin 7\theta$ 4) $-1/32$

46. The real part of complex number $\frac{1}{1+\cos\theta+i\sin\theta}$ is _____

1) 1 2) -1 3)- ½ 4) ½

47. If z= $\frac{1}{1+\cos\theta+i\sin\theta}$ θ) then |z| =____

1)cos θ/2 2) secθ/2 3) $\frac{1}{2}$ cos θ/2 4) $\frac{1}{2}$ sec θ/2

48. √ i + √-i = ____

1) i 2) 2i 3) 2 4) √2 i

49. $[(-\sqrt{-3}-1) / 2]^{201} + [(\sqrt{-3}-1)/2]^{201}$=_____

1) 1 2) 2 3) 3 4) 4

50. If $(x+iy)^{1/3}$ = 3+2i then x/3 +y/2 =___

1) 4 2) 10 3) 15 4) 20

51. If [1-(ix/a)] [1-(ix/b)] [1-(ix/c)] = -5i then $[1+(x^2/a^2)]\ [1+(x^2/b^2)]\ [1+(x^2/c^2)]$ =___

1) 5 2) 15 3) 25 4) 30

52. If I term and common ratio of a G.P. are both (1/3) [√2-(i/2)] then absolute value of its nth term is _____

1) $1/2^n$ 2) $1/2^{2n}$ 3) $-1/2^n$ 4) $-1/2^{2n}$

53. $(1-\omega+\omega^2)(1+\omega-\omega^2)$ =_____

1)2 2) 4 3) 6 4)-2

54. cis (2θ) cis(7θ) =_____

1) cis 9 θ 2) cis 5θ 3) cos 5θ 4) cos 9θ

55. cis 7θ / cis 3θ =_____

1) cis 10θ 2) cis 4θ 3) –cis 4θ 4) cos 4θ

56. I: The value of i^i is $e^{-\pi/2}$

II: The value of logi is iπ/2 which of the above statement is true.

1)only I 2)Only II 3)bothI&II 4)neither I nor II

57. z be a complex number then the locus of z such that

List-I	List-II
A)|z|=1	1)straight line
B)|z+2i|+|z-zi|=4	2)ellipse
C)Re(z^2)=4	3)hyperbola
D)$z.\bar{z}$=4	4)pair of straight lines

5)Circles

the correct match is

1)A-2,B-3,C-1,D-4 2)A-5,B-3,C-1,D-5

3)A-5,B-1,C-3,D-5 4)A-1,B-2,C-3,D-4

58. Assertion: Area of triangle formed by 1+i,-1+i,2i is '1' square units

Reason : Area of triangle fromed by the complex number z,iz,z+iz is $\frac{1}{2}|z|^2$

1) A is true, R is true and R is correct explanation of A
2) A is true, R is true and R is not correct explanation of A
3) A is true, R os false 4)A is false, R is true

59. If a = cis α, b = cis β, c = cis γ and $\frac{a}{b}+\frac{b}{c}+\frac{c}{a}=1$ then ∑ Cos(α -β) =

1) –1 2)0 3)1 4)2

60. The modulus of $\sqrt{2i}$ - $\sqrt{-2i}$ is

1)1/2 2) $\sqrt{2}$ 3)2 4)2 $\sqrt{2}$

61. The common roots of $x^{12}-1=0$ and $x^4+x^2+1=0$ are

1) $\pm\omega$, $\pm\omega^2$ 2) $\pm(1-\omega),\pm(1-\omega^2)$ 3) $\pm(2-\omega),\pm(3-\omega^2)$ 4)$\pm(3-\omega),\pm(3-\omega^2)$

62. $\frac{\sin 6\theta}{\sin\theta}=32\cos5\theta-32x+6\cos\theta \Rightarrow x=$

1) $\cos^3\theta$ 2) $\cos^2\theta$ 3)sin θ 4) cos θ

63. If ω is a complex cube root of unity, then $\sin\left[\left(\omega^{10}+\omega^{23}\pi-\frac{\pi}{4}\right)\right]=$

1) $\frac{1}{\sqrt{2}}$ 2) $\frac{1}{2}$ 3)1 4) $\frac{\sqrt{3}}{2}$

PREVIOUS EAMCET PAPERS PROBLEMS

64. If $|z_1+z_2|=|z_1-z_2|$, then the difference in the amplitude of z_1 and z_2 is ___

1) π/4 2) π/3 3) π/2 4) none [1985]

65. The continued product of the four values of [cos π/3 + i sin π/3] $^{3/4}$ is ____

1)-1 2) 1 3)2 4) -2 [1985]

66. If 1,ω,ω^2 are the cube roots of unity then (x+y+z) (x+yω+zω^2)(x+yω^2+zω)=

1)$x^3+y^3+z^3$ -3xyz 2) $x^3+y^3+z^3$ 3) $x^3+y^3+Z^3$+3xyz 4) none [1985]

67. | (α + iβ) / (β + iα)| =_____ [1985]

1) 1 2) 2 3)-1 4) 4

68. $(1-\omega+\omega^2)^7 + (1+\omega-\omega^2)^7 =$____ [1986]
1)128 2) 64 3) 256 4) none

69. If x= cosA + i sinA and y = cosB + i sin B then cos (A+B) in terms of x and y is
1) ½ [xy-(1/xy)] 2) ½ [xy+(1/xy)] 3) xy+(1/xy) 4) xy-(1/xy) [1986]

70. If $[(1+\cos\theta+i \sin \theta) / (\sin \theta + i + i \cos \theta)]^4 = \cos n \theta + i \sin n\theta$ then n=___
1)2 2) 3 3) 4 4) none
[1986]

71. $[(-1 + i\sqrt{3}) / 2]^{3n} + [(-1-i\sqrt{3})/2]^{3n} =$_____ [1986]
1)1 2) -1 3)2 4) 4

72. $[(1+i)/(1-i)]^3-[(1-i)/(1+i)]^3=a+ib$, then a=___ , b=____ [1987]
1)(1,2) 2)(-1,2) 3)(1,3) 4)(0,-2)

73. If |(z-i) / (z+i)| =1, locus of z is ____ [1987]
1)x-axis 2) y-axis 3) x=1 4) y=1

74. $(1-\omega+\omega^2)(1-\omega^2+\omega^4)(1-\omega^4+\omega^8)(1-\omega^8+\omega^{16}) =$_____ [1987]
1) 12 2) 14 3) 16 4) none

75. Smallest +ve integer n for which $[(1+I) / (1-i)]^n =1$ is _____ [1987]
1) 4 2) 3 3) 2 4) 6

76. If Z=x+iy and a is a real number such that | z-ai|=|z+ai| then the locus of z is ____
[1988]
1)x-axis 2)y-axis 3)x=y 4)$x^2+y^2=1$

77. $(1+\omega-\omega^2)^5+(1-\omega+\omega^2)^5=$___ [1990]
1)16 2)32 3)64 4)24

78. If $a=\cos4\pi/3+i\sin4\pi/3$ then $[(1+a)/2]^{3n}$ is _____ [1990]
1)$(-1/2)^{3n}$ 2)0 3)1 4)-1

79. Locus of |z-1|=|z+i| is ____ [1991]
1)circle 2)ellipse 3)line 4)none

80. $i^{243}=$____ [1991]
1)i 2)-i 3)1 4)none

81. If $1,\omega,\omega^2$ are the cube roots of unity, then $(a+b)^3 +(a\omega+b\omega^2)^3 +(a\omega^2+b\omega)^3=$
1)a^3+b^3 2)$3(a^3+b^3)$ 3)a^3-b^3 4)a^3+b^3+3ab [2000]

82. If θ is real, then the modulus of $1/[1+\cos\theta+i\sin\theta]$ is [2000]
1)$1/2\sec\theta/2$ 2) $1/2\cos\theta/2$ 3)$\sec\theta/2$ 4)$\cos\theta/2$

83. The locus of the point z in the Argand plane for which $|z+1|^2+|z-1|^2=4$ is a
1)straight line 2)pair of straight lines 3)circle 4)Parabola [2000]

84. If $\theta=\pi/6$, then the tenth term of $1+(\cos\theta+i\sin\theta)+(\cos\theta+i\sin\theta)^2+\ldots\ldots$is [2001]
1)i 2)-1 3)1 4)-i

85. If $\begin{vmatrix} 1-i & i \\ 1+2i & -i \end{vmatrix} = x+iy$, then x= [2001]
1)1 2)-1 3)2 4)-2

86. If 'a' is a complex number and 'b' is a real number, then the equation az+az+b=0 represents
1)straight line 2)parabola 3)circle 4)hyperbola [2001]

87. If z=3+5i, then $z^3+z+198=$ [2002]
1)-3-5i 2)-3+5i 3)3-5i 4)3+5i

88 If z=x+iy is a complex number satisfying $|z+i/2|^2=|z-i/2|^2$, then the locus of z is
1)x-axis 2)y-axis 3)y+x 4)2y=x [2002]

89. If $\sin6\theta=32\cos^5\theta\sin\theta-32\cos^3\theta\sin\theta+3x$, then x= [2003]
1)$\cos\theta$ 2)$\cos2\theta$ 3)$\sin\theta$ 4)$\sin2\theta$

90. If ω is a complex cube root of unity, then $225+(3\omega+8\omega^2)^2+(3\omega^2+8\omega)^2=$
1)72 2)192 3)200 4)248 [2003]

91. If the amplitude of z-2-3i is $\pi/4$, then the locus of z=x+iy is [2003]
1)x+y-1 2)x-y-1 3)x+y+1=0 4)x-y+1=0

92.. If $x_n=\cos\pi/2^n+i\sin\pi/2^n$ then $\prod_{n=1}^{\infty} x_n$
[2004]

1)-1 2)1 3)$1/\sqrt{2}$ 4) $i/\sqrt{2}$

93. $\sum_{n=0}^{\infty}\left(\frac{2i}{3}\right)^n =$ [2004]
1)$\frac{9+16i}{13}$ 2) $\frac{9-16i}{13}$ 3)9+6i 4)9-6i

94. If z_1, z_2 are two complex number satisfying $\frac{z_1 - 3z_2}{3 - \overline{z_1 z_2}} = 1$, $|z_1| \neq 3$ then $|z_2| =$__ [2004]

1)1 2)2 3)3 4)4

95 If α is a non-real root of $x^6=1$, then $\frac{\alpha^5+\alpha^3+\alpha+1}{\alpha^2+1}$ = ____ [2005]

1) α^2 2)0 3) $-\alpha^2$ 4) α

96. If $\alpha_1, \alpha_2, \alpha_3$ respectively denote the moduli of the complex number –i, $\frac{1}{3(1+i)}$ and -1+i, then their increasing order is [2005]

1) $\alpha_1, \alpha_2, \alpha_3$ 2) $\alpha_3, \alpha_2, \alpha_1$ 3) $\alpha_2, \alpha_1, \alpha_3$ 4) $\alpha_3, \alpha_1, \alpha_2$

97. The locus of the point z = x+iy satisfying the equation $\left|\frac{z-1}{z+1}\right|=1$ is given by

1)x=0 2)y=0 3)x=y 4) x+y=0 [2006]

98. The equation of the locus of z such that $\left|\frac{z-1}{z+1}\right| = 2$, when z =x+iy is complex number, is [2006]

1)$3x^2+3y^2+10y-3=0$ 2)$3x^2+3y^2+10y+3=0$ 3)$3x^2+3y^2-10y-3=0$ 4)$x^2+y^2-5y+3=0$

99 The product of the distinct $(2n)^{th}$ roots of $1+i\sqrt{3}$ is equal to: (2006)

1)0 2)$-1-i\sqrt{3}$ 3)$1+i\sqrt{3}$ 4)$-1+i\sqrt{3}$

100. The locus of the point z = x+iy satisfying $\left|\frac{z-2i}{z+2i}\right|=1$ is [2007]

1) x-axis 2) y-axis 3) y =2 4) x=2

101. A value of n such that $\left(\frac{\sqrt{3}}{2}+\frac{i}{2}\right)^n$ =1 is [2007]

1)12 2)3 3)2 4)1

102. If ω is a complex cube root of unity then sin $\{(\omega^{10}+\omega^{23})\pi - \frac{\pi}{4}\}$= (2008)

1) $\frac{1}{\sqrt{2}}$ 2) $\frac{1}{2}$ 3)1 4) $\frac{\sqrt{3}}{2}$

103. The points in the set $\{Z \in C : Arg\left(\frac{z-2}{z-6i}\right) = \frac{\pi}{2}\}$ lie on the curve which is a (2008)

1) circle 2) pair of lines 3)parabola 4)hyperbola

104. If m_1, m_2, m_3 and m_4 respectively denote the moduli of the complex numbers 1+4i,3+I,1-I and 2-3i then the correct one among the following is (2008)

1) $m_1 < m_2 < m_3 < m_4$ 2) $m_4 < m_3 < m_2 < m_1$
3) $m_3 < m_2 < m_4 < m_1$ 4) $m_3 < m_1 < m_2 < m_4$

105. If α and β are the roots of $x^2-2x+4 = 0$, then the value of $\alpha^6+\beta^6$ is: (2009)

1) 32 2) 64 3) 128 4) 256

106. The locus of z satisfying the inequality $\left|\frac{z+2i}{2z+i}\right| < 1$, where z = x + iy, is : (2009)

1) $x^2+y^2<1$ 2) $x^2-y^2<1$ 3) $x^2+y^2>1$ 4) $2x^2+3y^2<1$

107. If n is an integer which leaves remainder when divided by three, then $\left(1+\sqrt{3i}\right)^n + \left(1-\sqrt{3i}\right)^n =$ (2009)

1) -2^{n+1} 2) 2^{n+1} 3) $-(-2)^n$ 4) -2^n

108. $z = 1 + i\sqrt{3} \Rightarrow |Arg\, z| =$ (2010)

1) 0 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{2}$ 4) $\frac{2\pi}{3}$

109. If ω is a complex root of unity, then $(x+1)(x+\omega)(x-\omega-1) =$ (2010)

1) x^3-1 2) x^3+1 3) x^3+2 4) x^3-2

110. $(\sqrt{3}+i)+(\sqrt{3}-i)^7 =$ (2010)

1) $128\sqrt{3}$ 2) $256\sqrt{3}$ 3) $-128\sqrt{3}$ 4) $-256\sqrt{3}$

111. Let $z = a - \frac{i}{2}; a \in \square$. Then $|i+z|^2 - |i-z|^2 =$ [2011]

1) 2 2) -2 3) 4 4) -4

112. $\frac{(1+i)^{2011}}{(1-i)^{2009}} =$ [2011]

1) -1 2) 1 3) 2 4) -2

113. The locus of the complex number z such that $\arg\left(\frac{z-2}{z+2}\right) = \frac{\pi}{3}$ is: [2011]

1) A circle 2) A straight line 3) A parabola 4) An ellipse

114. If a, b, c, d $\in$ R are such that $a^2 + b^2 = 4$ and $c^2 + d^2 = 2$ & if $(a + ib)^2 = (c + id)^2(x + iy)$ then $x^2 + y^2 =$ [2012]

1) 4 2) 3 3) 2 4) 1

115. If α is a non real root of the equation $x^6 - 1 = 0$ then $\frac{\alpha^2+\alpha^3+\alpha^4+\alpha^5}{\alpha+1} =$ [2012]

1) α 2) 1 3) 0 4) – 1

116. If z is a complex number such that $\left|z-\frac{4}{z}\right| = 2$, then the greatest value of |z| is [2012]

1) $1+\sqrt{2}$ 2) $\sqrt{2}$ 3) $\sqrt{3}+1$ 4) $1+\sqrt{5}$

117. $\frac{(1+i)x-i}{2+i}+\frac{(1+2i)y+i}{2-i} = 1 \Rightarrow (x,y) =$ [2013]

1) $\left(\frac{7}{3},\frac{-7}{15}\right)$ 2) $\left(\frac{7}{3},\frac{7}{15}\right)$ 3) $\left(\frac{7}{3},\frac{-7}{15}\right)$ 4) $\left(\frac{7}{3},\frac{7}{15}\right)$

118. $\left(\frac{1+i}{1-i}\right)^4+\left(\frac{1-i}{1+i}\right)^4 =$ [2013]

1) 0 2) 1 3) 2 4) 4

119. f a complex number z satisfies $|z^2-1| = |z|^2+1$, then z lies on: [2013]

1) The real axis 2) The imaginary axis 3) y = x 4) A circle

120. The least positive integer n for which $(1 + i)^n = (1 - i)^n$ holds is (2014)

1) 2 2) 4 3) 6 4) 8

121. If $x=p+q$, $y=qw+qw^2$ & $z=pw^2+qw$ where w is a complex cube root of unity then xyz = (2014)

1) $p^2 - pq + q^2$ 2) $1 + p^3 + q^3$ 3) $p^3 - q^3$ 4) $p^3 + q^3$

122. If $Z_r = cos\left(\frac{\pi}{2^r}\right)+i\,sin\left(\frac{\pi}{2^r}\right)$ for r = 1, 2, 3, …….. then $Z_1, Z_2, Z_3, ,,,,,,\infty =$ (2014)

1) 1 2) 2 3) -1 4) -2

123. If $1,\omega,\omega^2$ are the cube roots of unity & if $\alpha = \omega + 2\omega^2 - 3$ then $\alpha^3 + 12\alpha^2 + 48\alpha + 3 =$ (2015)

1) -63 2) -62 3) -61 4) -60

124. If α,β are the roots of $1 + x + x^2 = 0$ then the value of $\alpha^4+\beta^4+\alpha^{-4}\beta^{-4} =$ (2015)

1) 0 2) 1 3) -1 4) -2

125. If α,β are roots of the equations $x^2 - 4x + 8 = 0$ then for any $n \in N$ $\alpha^{2n}+\beta^{2n} =$ (2015)

1) $2^{n+1} cos\frac{n\pi}{2}$ 2) $2^{3n} cos\frac{n\pi}{2}$ 3) $2^{3n+1} cos\frac{n\pi}{2}$ 4) $2^{3n} cos\frac{n\pi}{4}$

126. If α, β are the non – real cube roots of 2 then $\alpha^6 + \beta^6 =$ (2015)
1) 8 2) 4 3) 2 4) 1

127. If ω is a complex cube root of unity then $\omega^{\left(\frac{1}{3}+\frac{2}{9}+\frac{4}{27}+.....\infty\right)} + \omega^{\left(\frac{1}{2}+\frac{3}{8}+\frac{9}{32}+.....\infty\right)} =$
(2015 A.P.)
1) 1 2) -1 3) ω 4) i

128. $\left(\frac{1+cos\frac{\pi}{8}-i\,sin\frac{\pi}{8}}{1+cos\frac{\pi}{8}+i\,sin\frac{\pi}{8}}\right)^8 =$ (2015 A.P.)
1) 1 2) -1 3) 2 4) 1/2

129. $\sum_{k=1}^{6}\left[sin\frac{2k\pi}{7}-i\,cos\frac{2k\pi}{7}\right]=$ (2015 A.P.)
1) -1 2) 0 3) -i 4) i

130. The common roots of the equation $z^3 + 2z^2 + 2z + 1 = 0$, $Z^{2014} + Z^{2015} + 1 = 0$
(2015 A.P.)
1) ω, ω^2 2) $1, \omega, \omega^2$ 3) $-1, \omega, \omega^2$ 4) $-\omega, -\omega^2$

131. If z = x + iy is a complex number such that $\bar{z}^{\frac{1}{3}} = a + ib$, then the value of
$\frac{1}{a^2+b^2}\left(\frac{x}{a}+\frac{y}{b}\right)=$ (2016)
1) -1 2) -2 3) 0 4) 2

132. The locus of z satisfying |z| + |z -1 | = 3 is (2016)
1) A circle 2) A pair of straight lines
3) An ellipse 4) A parabola

133. If the point z = (1 + i)(1 + 2i)(1 + 3i) …….. (1 +10i) lies on a circle with centre at origin & radius r, then r^2 = (2016)
1) 10! 2)(2 x 3 x 4 x …… x 10
3) 2 x 5 x 10 x …….x 101 4) 11!

134. The minimum value of |z – 1| + |z – 5| is (2016)
1) 5 2) 4 3) 3 4) 2

135. The locus of the point representing the complex number z for which $|z + 3|^2 - |z - 3|^2 = 15$ is (2016AP)

1) A circle 2) A parabola 3) A straight line 4) An ellipse

136. $\frac{(1+i)^{2016}}{(1-i)^{2014}} =$ (2016AP)

1) -2i 2) 2i 3) 2 4) -2

137. If $|z_1| = 1$, $|z_2| = 2$, $|z_3| = 3$ & $|9z_1z_2 + 4z_1z_3 + z_2z_3| = 12$, then the value of $|z_1 + z_2 + z_3|$ is (2016AP)

1) 3 2) 4 3) 8 4) 2

138. If 1, z_1, z_2, ……. Z_{n-1} are the nth roots of unity, then $(1 - z_1)(1 - z_2)$ …….. $(1 - z_{n-1}) =$ (2016AP)

1) 0 2) n – 1 3) n 4) 1

139. (x + iy)(1 – 2i) is (2+i) then (2017)

1) x + iy = 1 – i 2) $x+iy=\frac{1-i}{1-2i}$ 3) $x-iy=\frac{1-i}{1+2i}$ 4) $x-iy=\frac{1-i}{1+i}$

140. The sum of the complex roots of the equation $(x - 1)^3 + 64 = 0$ is (2017)

1) 6 2) 3 3) 6i 4) 3i

141. If the imaginary part of $\frac{2z+1}{iz+1}$ is -2, then the locus of the point representing z in the complex plane is (2017)

1) A circle 2) A parabola 3) A straight line 4) An ellipse

142. $\left[\frac{1+\cos\left(\frac{\pi}{12}\right)+i\sin\left(\frac{\pi}{12}\right)}{1+\cos\left(\frac{\pi}{12}\right)-i\sin\left(\frac{\pi}{12}\right)}\right]^{72} =$ (2017)

1) 0 2) -1 3) 1 4) $\frac{1}{2}$

143. If ω is a complex cube root of unity, then $\sum_{k=1}^{6}\left(\omega^k+\frac{1}{\omega^k}\right)^2 =$ (2017AP)

1) 6 2) 8 3) 12 4) 24

144. In Argand plane, the quadrant in which $\frac{1+2i}{1-i}$ lies is (2017AP)

1) First 2) Second 3) Third 4) Fourth

145. If z = x + iy & if the point P in the Argand plane represents z, then the locus of P satisfying the equation |z – 3i| + |z + 3i| = 10 is (2017AP)

1) Circle with centre (-3, 3) 2) Hyperbola with eccentricity 5/3
3) Ellipse with eccentricity 3/5 4) Ellipse with eccentricity 4/5

146. If α, β are the roots of the equation $x^2 - 2x + 4 = 0$ & for any (2017AP)

$n \in N, \alpha^n + \beta^n = k\cos\frac{n\pi}{3}$ then k =

1) 2^n 2) 2^{n+1} 3) $2^n - 1$ 4) $2^n + 1$

147. The number of integral solution of $2\left(x^2 + \frac{1}{x^2}\right) - 7\left(x + \frac{1}{x}\right) + 9 = 0$ when $x \neq 0$ is

(2017AP)

1) 1 2) 2 3) 4 4) 0

KEY

1) 1	2) 3	3) 4	4) 4	5) 3	6) 3	7) 1	8) 3	9) 1	10) 4
11) 2	12) 3	13) 2	14) 4	15) 3	16) 3	17) 14	18) 3	19) 3	20) 2
21) 2	22) 2	23) 1	24) 1	25) 3	26) 2	27) 3	28) 1	29) 1	30) 2
31) 4	32) 1	33) 2	34) 2	35) 3	36) 2	37) 1	38) 1	39) 1	40) 2
41) 2	42) 2	43) 1	44) 2	45) 1	46) 4	47) 4	48) 4	49) 2	50) 4
51) 3	52) 1	53) 2	54) 4	55) 2	56) 3	57) 3	58) 1	59) 3	60) 3
61) 1	62) 1	63) 1	64) 3	65) 2	66) 1	67) 1	68) 1	69) 2	70) 3
71) 3	72) 4	73) 1	74) 3	75) 1	76) 1	77) 2	78) 2	79) 1	80) 3
81) 2	82) 1	83) 3	84) 4	85) 1	86) 1	87) 4	88) 1	89) 4	90) 4
91) 4	92) 1	93) 1	94) 1	95) 3	96) 3	97) 1	98) 2	99) 2	100) 1
101) 3	102) 1	103) 1	104) 3	105) 3	106) 3	107) 3	108) 4	109) 2	110) 3
111) 2	112) 1	113) 1	114) 1	115) 4	116) 4	117) 1	118) 2	119) 2	120) 4
121) 4	122) 1	123) 4	124) 1	125) 3	126) 1	127) 1	128) 1	129) 4	130) 1
131) 2	132) 3	133) 3	134) 2	135) 3	136) 1	137) 2	138) 1	139) 2	140) 2
141) 3	142) 3	143) 3	144) 2	145) 3	146) 2	147) 1	148)	149)	150)

AIEEE PROBLEMS

1. If $\left(\frac{1+i}{1-i}\right)^x = 1$ then [2003]

1) $x = 4n$ where n is any positive integer
2) $x = 2n$ where n is any positive integer
3) $x = 4n+1$ where n is any positive integer
4) $x = 2n+1$ where n is any positive integer

2. If $z = x - iy$ and $z^{1/3} = p + iq$, then $\left(\frac{x}{p} + \frac{y}{q}\right)/\left(p^2 + q^2\right) =$ [2004]

1) 1 2) –2 3) 2 4) –1

3. If the cube roots of unity are 1, ω, ω^2 then the roots of the equation $(x-1)^3 + 8 = 0$ are [2005]

1) $-1, -1+2\omega, -1-2\omega^2$ 2) –1, –1, –1
3) $-1, 1-2\omega, 1-2\omega^2$ 4) $-1, 1+2\omega, 1+2\omega^2$

4. If z_1 and z_2 are two non-zero complex numbers such that $|z_1 + z_2| = |z_1| + |z_2|$, then Arg z_1 – Arg z_2 is [2005]
1) -π 2) –π/2 3) 0 4) π/2

5. Lt z, w be complex numbers such that $\bar{z} + i\bar{w} = 0$ and arg zw = π. Then arg z = [2004]
1) π/4 2) 5π/4 3) 3π/4 4) π/2

6. If z and ω are two nonzero complex numbers such that $|z\omega| = 1$ and Arg (z) – Arg (ω) = π/2 then $\bar{z}\omega = 0$ [2003]
1) 1 2) –1 3) i 4) $-i$

7. If $\omega = \dfrac{z}{z - \frac{1}{3}i}$ and $|\omega| = 1$, then z lies on [2005]
1) an ellipse 2) a circle 3) a straight line 4) a parabola

8. If $|z^2 - 1| = |z|^2 + 1$, then z lies on [2004]
1) the real axis 2) an ellipse 3) a circle 4) the imaginary axis

9. If $z^2+z+1 = 0$, where z is a complex number, then the value of [2006]
$\left(z+\frac{1}{z}\right)^2 + \left(z^2+\frac{1}{z^2}\right)^2 + \left(z^3+\frac{1}{z^3}\right)^2 + ... + \left(z^6+\frac{1}{z^6}\right)^2$ is
1) 6 2) 12 3) 18 4) 54

KEY

1) 1	2) 2	3) 3	4) 1	5) 3	6) 4	7) 3	8) 4	9) 1	

EXERCISE-B

Note: $(a+\omega)(a+\omega^2) = a^2 - a + 1$

1. $(2+\omega)(2+\omega^2) =$
   1)1 2)2 3)3 4)4

2. $(3+\omega)(3+\omega^2) =$
   1)7 2)2 3)3 4)4

3. $(4+\omega)(4+\omega^2) =$
   1)1 2)2 3)13 4)4

Note: $(a-\omega)(a-\omega^2) = a^2 + a + 1$

4. $(2-\omega)(2-\omega^2) =$
   1)4 2)6 3)9 4)7

5. $(3-\omega)(3-\omega^2) =$
   1)23 2)31 3)13 4)33

6. $(5-\omega)(5-\omega^2) =$
   1)3 2)31 3)34 4)13

7. The value of $\log(-\theta)$ is
   1)logi 2)$\log\theta + \pi$ i 3) $\log\theta$ 4)1

8. The value of log(-1) is
   1)logi 2) π i 3) $\log\theta$ 4)1

KEY

1)**3**	2)**1**	3)**3**	4)**4**	5)**3**	6)**2**	7)**2**	8)**2**

3. QUADRATIC EXPRESSIONS

1. An equation of the form $ax^2 + bx + c = 0$ where $a \neq 0$, b, c $\in$ R is called quadratic expression.

2. The roots of $ax^2 + bx + c = 0$ are $\dfrac{-b+\sqrt{b^2-4ac}}{2a}$ and $\dfrac{-b-\sqrt{b^2-4ac}}{2a}$

3. If α, β are the roots then
   $\alpha + \beta == \dfrac{-b}{a}$ and $\alpha\ \beta == \dfrac{c}{a}$

4. $\alpha^2 + \beta^2 = \dfrac{b^2 - 2ac}{a^2}$ and $\alpha^3 + \beta^3 = \dfrac{3abc - b^3}{a^3}$

5. The condition that the roots of the equation $ax^2 + bx + c = 0$ are in the ratio m: n is $(m+n)^2 ac = nmb^2$

6. The condition that one root of $ax^2 + bx + c = 0$ is n times the other is $nb^2 = (1+n)^2 ac$

7. If the difference of the roots of $ax^2 + bx + c = 0$ is k then $k^2 = \dfrac{b^2 - 4ac}{a^2}$

8. If the roots of $x^2 - px + q = 0$ differ by unity then $p^2 = 4q+1$

9. The condition that the equations $a_1x^2 + b_1x + c_1 = 0$ and $a_2x^2 + b_2x + c_2 = 0 = 0$ have same roots is $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2}$

10. If α, β are the roots of $f(x) = ax^2+bx+c=0$ then the quadratic equation whose roots are $\dfrac{1}{\alpha}, \dfrac{1}{\beta}$ is $f(\dfrac{1}{x}) = 0$

11. The quadratic equation whose roots are –α, -β is f(-x) =0

12. In the quadratic expression $ax^2+bx+c=0$ the expression 'b^2-4ac' is called the discriminant. If $\Delta = b^2-4ac$ and
    i. $\Delta>0$ and is a perfect square then the roots are real rational and unequal.
    ii. $\Delta>0$ and is not a perfect square, then the roots are real irrational and unequal. They occur in pairs i.e. if one root is a+√ b then the other root is a-√b.
    iii. $\Delta=0$ then the roots are real, rational and equal & both are equal to –b/2a

iv. $\Delta<0$ then the roots are complex and they occur in pairs. i.e If one root is a+ib then other root is a-ib

13. In the equation $ax^2+bx+c=0$ if a+b+c=0 then the roots are 1 & c/a.

14. In the equation $ax^2+bx+c=0$. If a+c=b then the roots are 1 & -c/a .

15. The condition for the roots to be reciprocal of each other is c = a.

17. The condition for one root to be nth power of the other is $\left(a^n c\right)^{\frac{1}{n+1}}+\left(ac^n\right)^{\frac{1}{n+1}}+b=0$.

18. The condition for one root of the equation $ax^2+bx+c=0$ to be square of the other is $a^2c+ac^2+b^3=3abc$.

19. The condition for the equation $a_1x^2+b_1x+c_1=0$ and $a_2x^2+b_2x+c_2=0$ to have one root in common is $(c_1a_2-c_2a_1)^2=(a_1b_2-a_2b_1)(b_1c_2-b_2c_1)$ & common root is $\frac{c_1a_2-c_2a_1}{a_1b_2-a_2b_1}$ or $\frac{b_1c_2-b_2c_1}{a_1b_2-a_2b_1}$.

20. If α and β are the roots of the equation $a\ x^2+b\ x+c\ =0$ then the equation whose roots are

1)- α ,-β is $ax^2-bx+c=0$

2) $\frac{-1}{\alpha},\frac{-1}{\beta}$ is $cx^2-bx+a=0$

3) α+k , β+k is $a(x-k)^2+b(x-k)+c=0$

4) $\frac{1}{\alpha},\frac{1}{\beta}$ is $cx^2-bx+a=0$

5)kα ,k β is $a\left(\frac{x}{k}\right)^2+b\left(\frac{x}{k}\right)^2+c=0$

21. The quadratic equation $ax^2+bx+c=0$

1) If a and c are the same sign then the product of the roots c/a is positive.
2) If a and c are of the opposite signs then product of the roots c/a is negative.
3) If a+b+c =0 then the roots are 1 and $\frac{c}{a}$.
4) If a-b+c=0 then the roots are -1 and $-\frac{c}{a}$.
5) If the roots are negative then a,b,c will have the same sign.
6) If the roots are positive then a,c will heave the same sign different from the sign of b.

22. If the equation $ax^2+bx+c=0$ has complex roots than $\forall x \in R$ and a will have the same sign.

23. If the equation $ax^2+bx+c=0$ has equal roots then $\forall x \in R - \left(\frac{-b}{2a}\right)$, ax^2+bx+c and a will have the same sign.

24. If the equation $ax^2+bx+c=0$ has real roots α and β ($\alpha < \beta$) then
1)$\alpha < x < \beta \Rightarrow ax^2+bx+c$ and a will have opposite signs.
2) $x < \alpha$ or $x > \beta \Rightarrow ax^2+bx+c$ and a will have the same sign.

25. $\forall x \in R$ and if a>0 then the minimum value of ax^2+bx+c at x=$\left(\frac{-b}{2a}\right)$ is $\frac{4ac-b^2}{4a}$.

26. $\forall x \in R$ and if a<0 then the maximum value of ax^2+bx+c at x=$\left(\frac{-b}{2a}\right)$ is $\frac{4ac-b^2}{4a}$.

27. The necessary and sufficient condition for the quadratic expression $ax^2+2hxy+by^2+2gx+2fy+c$ to be expressed as a product of two linear factors if $abc+2fgh-af^2-bg^2-ch^2=0$ or

$$\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix} = 0, \quad h^2 \geq ab,\ g^2 \geq ac,\ f^2 \geq bc.$$

EXERCISE-A

1. If a, b are the roots of $x^2+x+1=0$ then $a^2+b^2=$
1)1 2)2 3)-1 4)4

2. If α, β are the roots of $3x^2-5x+7=0$ then $\alpha^2+\beta^2=$
1) $\frac{5}{3}$ 2) $\frac{7}{3}$ 3) $\frac{-17}{9}$ 4) $\frac{35}{9}$

3. If α, β are the roots of $3x^2-5x+7=0$ then $\alpha^3+\beta^3=$
1) $\frac{90}{7}$ 2) $\frac{-120}{7}$ 3) $\frac{170}{23}$ 4) $\frac{-190}{27}$

4. The roots of $35x^2+13x-12=0 \quad =0$ are
1) 1 or 2 2) 2 or 3 3)1/2 or 1/3 4)3/7 or -4/5

5. If α, β are the roots of $x^2+x+1=0$ then $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=$
1)-1 2)1 3)2 4)-2

6. If α, β are the roots of $ax^2+bx+c = 0$ then $\alpha^3 + \beta^3 =$

1) $\frac{3abc-b^3}{a^3}$ 2) $-\frac{b}{c}$ 3) $\frac{b^2-2ac}{c^2}$ 4) $\frac{b^2-2ac}{ac}$

7. If α, β are the roots of $ax^2+bx+c=0$ then $\left(\frac{\alpha}{\beta}-\frac{\beta}{\alpha}\right)^2 =$

1) $\frac{b^2(b^2-4ac)}{c^2a^2}$ 2) $\frac{b^2(b^2-4ac)}{ca^3}$

3) $\frac{b^2(b^2-4ac)}{a^4}$ 4) $\frac{b^2(b^2-4ac)}{c^4}$

8. $x^2 -3x-4 < 0 \Rightarrow$

1) $-1< x <4$ 2) $3< x < 4$ 3) $1< x < 4$ 4) $-3< x <4$

9. $x^2+6x-27 > 0$; $3x-x^2+4>0 \Rightarrow$

1) $-9<x<3$ 2) $-3<x<1$ 3) $-1 <x<3$ 4) $3<x<4$

10. $\frac{x-1}{4x+5} < \frac{x-3}{4x-3} \Rightarrow x \in \ldots.$

1) $-5/4 <x<3/4$ 2) $-3/4 < x<5/4$ 3) $-3<x<5$ 4) $-5<x<3$

NOTE : The condition that the expression $ax^2 + 2hxy +by^2 + 2gx +2fy +c$ can be resolved into two linear factors is $abc +2fgh -af^2-bg^2 -ch^2 = 0$.

11. If the expression $4xy +2x +2ky +3$ can be resolved into two factors then k =

1)3 2)2 3)4 4)1

12. If $4x^2+4xy-ky^2 -12x-2y+ 8$ is resolvable into two linear factors, then k=

1)1 2) 2 3)3 4) 4

13. If $ax^2+2cxy+by^2+2bx+2ay+c$ is resolvable into two linear factors, then

1)$a^3+b^3+c^3= abc$ 2) $a^3+b^3+c^3=3abc$ 3) $a+b+c = abc$ 4) $a+b+c=3abc$

14. If $xy+kx+y+1 =0$ has two linear factors, then the value of k is

1)1 2) 2 3)3 4) 4

15. The minimum value of $3x^2+4x+1$ is

1)1/3 2)2/3 3)-1/3 4)-2/3

16. The maximum value of $4x -x^2 -10$ is

1) 6 2)4 3)-6 4)-4

17. The minimum value of x^2-x is

1)-1/4 2) ¼ 3) -1/2 4) 1/2

18. The maximum value of a^2-abx-b^2x^2 is
1) $5a^2/4$ 2) 4a/5 3) 4a2/5 4) $5/4a^2$

19. $2x^2+x-1 \leq 0 \Rightarrow$x belongs to the interval
1) [-1,1/2] 2) [-1/2,1] 3) [1/2,1] 4) [1,2]

20. $x^2-6x+5<0$; $x^2-5x+6>0 \Rightarrow x \in$
1)(1,2) ∪ (3,5) 2) (1,3) ∪(4,5) 3) (2,3) ∪(4,5) 4) (1,4)∪(5,6)

21. If ω is a complex cube root of unity, the equation whose roots are $2\omega+3\omega^2$ is
1)x^2-5x+7=0 2) x^2+5x-7=0 3) 2-5x+7=0 4)x^2-5x-7=0

22. 2+i√3 is one root of x^2+px+q=0 . If p,q are real, then p=
1) -2 2) -4 3) 2 4) 4

NOTE: The condition that one root of ax^2+bx+c=0 is n times the other is $nb^2= (1+n)^2ac$.

23. If one root of ax^2+bx+c =0 is twice that of the other, then
1) 2b=9ac 2) 9b=2ac 3) $9b^2$=2ac 4) $2b^2$=9ac

24. One root of $px^2 - 14x + 8 = 0$ is six times the other root. Then p=
1)4 2)3 3)2 4)1

25. If α, β are the roots of ax^2+bx+c=0 , then $\alpha^3+\beta^3$ =
1) $\frac{3abc-b^3}{a}$ 2) $\frac{3abc-b^3}{a^2}$ 3) $\frac{3abc-b^3}{a^3}$ 4) $\frac{3abc-b^3}{a^4}$

26. If a ≠b, then the common root of x^2+ax+b=0 and x^2+bx+a=0 is
1) -1 2) -2 3)1 4)2

27. $x = \sqrt{1+\sqrt{1+\sqrt{1+}}} \ldots \Rightarrow$ x =
1) 1+√3 / 2 2) 1+√5/2 3) 1+√3/4 4) 1+√5/4

28. The roots of $|x^2-x-6|=x+2$ are
1)0,1,4 2) 0,2,4 3) -2,1,4 3) -2,1,4 4) -2,2,4

29. The number of solution of x^2-7|x| +12=0 is
1) 4 2) 3 3) 2 4)1

30. α, β are the roots of $x^2 + kx + 2 = 0$, if α-β=1, then k=

1) +1 2)+2 3)+3 4) 4

31. If α, β are the roots of $x^2 + px + q = 0$ then $\frac{\alpha^2 + \beta^2}{\alpha^{-2} + \beta^{-2}}$ =

1) p^2 2) q^2 3) p+q 4) p^2+q^2

32. The difference of the roots of $x^2 - bx + c = 0$ is same as the difference of the roots of $x^2 - cx + b = 0$ if b≠c = then b+c =____

1)-1 2)-2 3) -3 4)-4

33. The equation whose roots exceed by 2 then the roots of the equation $3x^2-7x+4=0$ is _____

1) $3x^2 + 19x + 30 = 0$ 2) $3x^2 + 19x - 30 = 0$

3) $3x^2 - 19x + 30 = 0$ 4) $3x^2 - 19x - 30 = 0$

34. m, n, k are rational number such that $m = k + \frac{n}{k}$ then roots of $x^2 + mx + n = 0$ are

1) $-k, -\frac{n}{k}$ 2) $k, \frac{n}{k}$ 3) $-2k, -\frac{n}{2k}$ 4) $3k, \frac{n}{3k}$

35. The roots of $(b-c)x^2 + (c-a)x+(a-b) =0$ are equal then

1) 2b=a+c 2) b=a+c 3) 3b=a+2c 4) b=2a+3c

36. If the roots of $px^2+qx+2=0$ are reciprocals of each other, then

1) p=-2 2) p=0 3) p=1/2 4) p=2

37. If x^2-3x+2 is a factor of $x^4-px^2+q=0$, then (p,q) =

1) (-4,-5) 2) (4,5) 3) (-5,-4) 4) (5,4)

38. If one root of the equation $x^2+px+12=0$ is 4, while the equation $x^2+px+q=0$ has equal roots, then q=

1) 49/4 2) 9/4 3) 4/49 4) 4/9

39. If 2,3 are the roots of the equation $2x^3+px^2-13x+q=0$, then (p,q) =

1) (-5,-30) 2) (-5,30) 3) (5,-30) 4) (5,30)

40. If $2x^2 - 3x + c = 0$ and $x^2 - 9x+20 = 0$ have a common roots then c =

1) -20, -35 2)20, 35 3)15,30 4)-15,-30

41. If $x^2+4ax+3 = 0$ and $2x^2 +3ax - 9 =0$ have a common root then a =

1)±2 2) ±3 3) ± 1 4) ±4

42. If the equations k $(6x^2+3)$ rx+$2x^2$-1 =0 and 6k$(2x^2+1)$ +px+$4x^2$-2=0 have both the roots common, then the value of 2r-p is
1) 0 2) 1 3)2 4)3

43. I: The maximum value of c+2bx -x^2 is c+b^2
II: The minimum value of x^2+2bx+c is c-b^2.
1)only I is true 2)only II is true 3)both I and II are true 4)neither I nor II true.

44. If A,B are the sum and product of the roots of $2x^2$-3x+1=0 and C,D are the roots of $3x^2$-4x+2=0 then the ascending order of A,B,C,D is
1)A,B,C,D 2)B,D,C,A 3)A,C,B,D 4)D,B,A,C

45. Match the following
I. If one root of x^2+kx+12=0 is the triple the other, then k= a) $\pm$10
II. If one root of $8x^2$-6x+k=0 is the double the other then k= b) $\pm$8
III. If one root of kx^2-14x+8=0 is six times the other then k= c) 1
IV. If the roots of $12x^2$+kx+2=0 may be in the ratio 3:2 then k= d)3
1)a,c,d,b 2)d,c,b,a 3)b,c,d,a 4)c,d,a,b

NOTE: If the difference of the roots of ax^2+bx+c = 0 is k then $k^2 = \frac{b^2-4ac}{a^2}$.

46. If the difference of the roots of kx^2+3x – 4 = 0 is 5, then k =
1) 1 or $\frac{3}{25}$ 2) 1 or $\frac{9}{25}$ 3)1 or $\frac{9}{5}$ 4)1 or $\frac{3}{5}$

NOTE: If the roots of x^2 –px +q = 0 differ by unity then p^2 = 4q + 1.

47. If the roots of x^2-3x +k = 0 differ by unity then k =
1)3 2)2 3)0 4)1

NOTE: The condition that the equations $a_1x^2+b_1x+c_1=0$ and $a_2x^2+b_2x+c_2=0$ have the same roots is $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

48. If the equation $3x^2$+4x-5 = 0 and ax^2+8x-10 = 0 have the same roots then a =
1)3 2)4 3)2 4)6

49. If α, β are the roots of the equation x^2 + x-1 = 0 then the quadratic equation whose roots are α-2,β-2 is
1) x^2+5x+5 = 0 2) x^2-5x+5 = 0 3) x^2+5x-5 = 0 4) x^2-5x-5 = 0

50. If α, β are the roots of the equation x^2 + x-1 = 0 then the quadratic equation whose roots are $\frac{\alpha}{3},\frac{\beta}{3}$ is
1) $9x^2$+3x+1 = 0 2) $9x^2$-3x+1 = 0 3) $9x^2$+3x-1 = 0 4)9 x^2-3x-1 =0

NOTE: The turning point on the graph of $y = ax^2 + bx + c$ has the coordinates $\left(\frac{-b}{2a}, \frac{4ac-b^2}{4a}\right)$.

51. The coordinates of the turning point of $y = 3x^2 + 4x - 1$ are
1) $\left(\frac{-2}{3}, \frac{7}{3}\right)$ 2) $\left(\frac{-2}{3}, \frac{-7}{3}\right)$ 3) $\left(\frac{2}{3}, \frac{-7}{3}\right)$ 4) $\left(\frac{2}{3}, \frac{7}{3}\right)$

NOTE: If the roots of the equation $x^2+px+q = 0$ be equal to ratio of the roots of $x^2+lx+m = 0$ then $\frac{p^2}{l^2} = \frac{q}{m}$.

52. If the roots of the equation $x^2+ax+18 = 0$ be equal to ratio of the roots of $x^2+2x+2=0$ then a =
1) ±3 2) ±6 3) ±8 4) ±4

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53. If 3+4i is a root of $x^2+px+q=0$ then (p,q)= (1996)
1)(6,25) 2)(6,1) 3)(-6,-7) 4)(-6,25)

54. If $x^2+6x-27>0, -x^2+3x+4>0$ then 'x' lies in the interval (1996)
1)(3,4) 2)(-3,4) 3)(-∞,3)U(4,∞) 4)(-4,-3)

55. If one root of the quadratic equation $ax^2+bx+c=0$ is 3-4i then 31a+b+c= (1996)
1)0 2)2a 3)2b 4)2c

56. The expression $2x^2+4x+7$ has minimum value m at x=∝ . the ordered pair (∝,m)=
1)(-1,5) 2)(-1,-5) 3)(1,-5) 4)(1,5) (1996)

57. If $p(q-r)x^2+q(r-p)x+r(p-q)=0$ has equal roots, then 2/q= (1996)
1) $\frac{p-r}{p+r}$ 2) $\frac{p-r}{pr}$ 3) $\frac{p+r}{pr}$ 4) $\frac{p+r}{p-r}$

58. The minimum value of the quadratic expression $x^2+2bx+c$ is (1997)
1)cb^2 2)c^2b 3)$c+b^2$ 4)$c- b^2$

59. If α,β are the roots of $ax^2+bx+c=0$, then the equation whose roots are α+β,αβ is (1997)
1)$a^2x^2+a(b-c)x+bc=0$ 2)$a^2x^2+a(b-c)x-bc=0$
3)$a^2x^2+(b+c)x+bc=0$ 4)$a^2x^2 -(b+c)x+bc=0$

60. The minimum value of $x^2-8x+17, x\in R$ is (1998)
1)17 2)-1 3)1 4)2

61. If the sum of the squares of the roots of $x^2+px-3=0$ is 10 then p= (1998)
1)±2 2)±3 3)5 4)-5

62. The maximum value of $c+2bx-x^2$ is (1999)
1)b^2c 2)b^2-c 3)$c-b^2$ 4)b^2+c

63. If $2x-7-5x^2$ has maximum value at x=a, then a= (1999)
1)$\frac{-1}{5}$ 2) $\frac{1}{5}$ 3) $\frac{34}{5}$ 4) $\frac{-34}{5}$

64. If α, β are the roots of $9x^2+6x+1=0$ then the equation with the roots $\frac{1}{\alpha},\frac{1}{\beta}$ is (2000)
1)$2x^2+3x+18=0$ 2)$x^2+6x-9=0$ 3)$x^2+6x+9=0$ 4)$x^2-6x+9=0$

65. The equation formed by decreasing each root of $ax^2+bx+c=0$ by 1 is $2x^2+8x+2=0$ then
1)a= -b 2)b= -c 3)c= -a 4)b= a+c (2000)

66. If 3+i is a root of the equation $x^2+ax+b=0$ then a= (2000)
1)3 2)-3 3)6 4)-6

67. If the roots of $x^2-bx+c=0$ are two consecutive integers, then b^2-4c=
1) 0 2) 1 3)2 4)3

68. If α, β are the roots of $x^2+bx+c=0$ and α + h, β + h are the roots of $x^2+qx+r=0$ then h=
1)b+q 2)b-q 3)1/2(b+q) 4)1/2(b-q) (2001)

69. If 3 is a root of $x^2+kx-24=0$ it is also a root of____ (2002)
1)$x^2+5x+k=0$ 2)$x^2+kx+24=0$ 3)$x^2-kx-6=0$ 4)$x^2-5x+k=0$

70. If the equation $x^2+ax+b=0$ and $x^2+bx+a=0$ ($a\neq b$) have a common root then a+b=
1)-1 2)1 3)3 4)3 (2002)

71. The minimum value of $2x^2+x-1$ is (2003)
1)$\frac{1}{4}$ 2)$\frac{3}{2}$ 3)$\frac{-9}{8}$ 4)$\frac{9}{4}$

72. The solution set contained in R of the inequation $3^x+3^{1-x}-4<0$ is (2003)
1)(1,3) 2)(0,1) 3)(1,2) 4)(0,2)

73. The set of all solutions of theinequation $x^2-2x+5\leq 0$ in R is (2004)
1)R-(-∞,-5) 2)R-(5,∞) 3)∅ 4)R-(-∞ ,-4)

74. If (x-2) is a common factor of the expression x^2+ax+b and x^2+cx+d, then $\frac{b-d}{c-a}$ (2004)

1)-2 2)-1 3)1 4)2

75. If x is real then the minimum value of $\frac{x^2-x+1}{x^2+x+1}$ is (2005)

1)1/3 2)3 3)1/2 4)1

76. E_1:a+b+c=0 if 1 is a root of $ax^2+bx+c=0$ (2005)
E_2: $b^2-a^2=2ac$ if sinθ , cosθ are the roots of $ax^2+bx+c=0$.
Which of the following is true?
1)$E_1$is true, E_2 is true 2)$E_1$is true, E_2 is false
3)$E_1$is false, E_2 is true 4)$E_1$is false, E_2 is false

77. If $\sqrt{9x^2+6x+1} < (2-x)$, then (2006)
1)$x\in(-3/2,1/4)$ 2)$x\in(3/2,1/4]$ 3)$x\in[3/2,1/4)$ 4)$x<1/4$

78. The set of values of *x* for which the inqualities $x^2-3x-10<0$ and $10x-x^2-16>0$ hold simultaneously, is (2007)
1)(-2,5) 2)(2,8) 3)(-2,8) 4)(2,5)

79. If α ,β are the roots of the equation $ax^2+bx+c=0$ and if $px^2+qx+r=0$ has roots $\frac{1-\alpha}{\alpha}$ and $\frac{1-\beta}{\beta}$ then r = (2007)
1)a +2b 2)a +b +c 3)ab +bc +ca 4)abc

80. $x(x-a^2)>0$; $x^2-a^4<0 \Rightarrow x\in$
1)(-a,0) 2) (0,a) 3) $(-a^2,0)$ 4) $(0,a^2)$

81. $x^2-3x+2>0$; $x^2-3x-4\leq 0 \Rightarrow x\in$
1) $[0,1)\cup(2,3]$ 2) $[-1,1)\cup(2,4]$ 3) $[-1,2)\cup)3,5]$ 4) $[1,3)\cup(4,5]$

82. If α,β are the roots of $ax^2+bx+c=0$, then the equation whose roots are 2+α, 2+β is
1) $ax^2+(4a-b)x+4a-2b+c=0$ 2) $ax^2+(4a-b)x+4a+2b+c=0$
3) $ax^2+(b-4a)x+4a+2b+c=0$ 4) $ax^2+(b-4a)x+4a-2b+c=0$

83. If the roots of $x^2-bx+c=0$ are two consecutive integers, then $b^2-4c=$
1) 0 2) 1 3)2 4)3

84. I: If 8 and 2 are the roots of $x^2+ax+\beta=0$ and 3,3 are the roots of $x^2+\alpha x+b=0$ then the roots of the equation $x^2+ax+b=0$ are 9,-1.

II: If k>0 and the product of the roots of the equation $x^2-3kx+2e^{2\log k}-1=0$ is 49 then the sum of the roots is 15.

1)only I is true 2)only II is true
3)both I and II are true 4)neither I nor II are true.

85. The roots x_1 and x_2 of the equation $x^2+px+12=0$ are such that $x_1-x_2=1$ then p=
1) ±3 2) ±5 3) ±7 4) ±9

86. Match the following.

I. The roots of $2x^2-9x+7=0$ are	a)imaginary
II. The roots of $9x^2-6x+1=0$ are	b)irrational and not equal
III. The roots of $3x^2+4x-2$ are	c)rational and equal
IV. The roots of $6x^2+7x+12=0$ are	d)rational and not equal

1)a,c,d,b 2)d,c,b,a 3)b,c,d,a 4)c,d,b,a

87. If $\alpha+\beta=-2$ and $\alpha^3+\beta^3=-56$ then the quadratic equation whose roots are α and β is (2008)
1)$x^2+2x-16=0$ 2) $x^2+2x-15=0$ 3)$x^2+2x-12=0$ 4)$x^2+2x-8=0$

88. Let α and β are the roots of the equation $ax^2+bx+c=0$.Observe the given list below:

List-1	List-2
i) $\alpha=\beta\Rightarrow$	A) $(ac^2)^{\frac{1}{3}}+(a^2c)^{\frac{1}{3}}+b=0$
ii) $\alpha=2\beta\Rightarrow$	B)$2b^2=9ac$
ii) $\alpha=3\beta\Rightarrow$	C)$b^2=6ac$
iv) ii) $\alpha=\beta^2\Rightarrow$	D)$3b^2=16ac$
	E) $b^2=4ac$
	F) $(ac^2)^{\frac{1}{3}}+(a^2c)^{\frac{1}{3}}=b$

The correct match of List-1 from List-2 is (2008)

	(i)	(ii)	(iii)	(iv)
(1)	E	B	D	F
(2)	E	B	A	D
(3)	E	D	B	F
(4)	E	B	D	A

89. The roots of (x–a) (x–a–) + (x–a–1)(x–a–2)+(x–a)(x–a–2) = 0.a∈R are always:(2009)
1) equal 2) imaginary 3) real and distinct 4) rational and equal

90. Let $f(x)=x^2+ax+b$, where a, b ∈ IR. If f(x) = 0 has all its roots imaginary, then the roots of f(x) + f'(x) + f''(x) = 0 are: (2009)
1) real and distinct 2) imaginary 3) equal 4) rational and equal

91. For $x \in IR$, the least value of $\frac{x^2-6x+5}{x^2+2x+1}$ is : (2010)

1) -1 2) $\frac{-1}{2}$ 3) $\frac{-1}{4}$ 4) $\frac{-1}{3}$

92. $\left\{x \in IR : \frac{14x}{x+1} - \frac{9x-30}{x-4} < 0\right\} =$ (2010)

1) $(-1,4)$ 2) $(1,4) \cup (5,7)$ 3) $(1,7)$ 4) $(-1,1) \cup (4,6)$

93. If a>0 & b^2-4ac=0, then the curve y=ax^2+bx+c [2011]
1) cuts the x-axis 2) touches the x-axis & lies below it
3) lies entirely above the axis 4) touches the x-axis & lies above it.

94. If a>0 & b^2-4ac=0, then the curve y=ax^2+bx+c [2011]
1) cuts the x-axis 2) touches the x-axis & lies below it
3) lies entirely above the axis 4) touches the x-axis & lies above it.

95. The product of real roots of the equation $|x|^{\frac{3}{5}} - 26|x|^{\frac{3}{5}} - 27 = 0$ is [2012]

1) -3^{10} 2) -3^{12} 3) $-3^{12/5}$ 4) $-3^{21/5}$

96. The product of real roots of the equation $|x|^{\frac{3}{5}} - 26|x|^{\frac{3}{5}} - 27 = 0$ is [2012]

2) -3^{10} 2) -3^{12} 3) $-3^{12/5}$ 4) $-3^{21/5}$

97. If the harmonic mean between the roots of $\left(5+\sqrt{2}\right)x^2 - bx + \left(8+2\sqrt{5}\right) = 0$ is 4, then the value of b [2013]

1) 2 2) 3 3) $4-\sqrt{5}$ 4) $4+\sqrt{5}$

98. If x_1 & x_2 are the real roots of the equation $x^2 - kx + c = 0$ then the distance between the points $A(x_1, 0)$ & $B(x_1, 0)$ is
(2014)

1) $\sqrt{k^2-c}$ 2) $\sqrt{c-k^2}$ 3) $\sqrt{k^2-4c}$ 4) $\sqrt{k^2+4c}$

99. If x is real, then the minimum value of $y = \frac{x^2-x+1}{x^2+x+1}$ is (2014)

1) 1/3 2) 1/2 3) 2 4) 3

100. Let $\alpha \neq \beta$ satisfying $\alpha^2 + 1 = 6\alpha, \beta^2 + 1 = 6\beta$ the the quadratic equation whose roots are $\frac{\alpha}{\alpha+1}, \frac{\beta}{\beta+1}$ is (2015)

1) $8x^2 + 8x + 1 = 0$ 2) $8x^2 - 8x - 1 = 0$
3) $8x^2 - 8x + 1 = 0$ 4) $8x^2 + 8x - 1 = 0$

101. The set of solution of $|x|^2 - 5|x| + 4 < 0$ is (2015)

1) (-4, -1) 2) (1, 4) 3) (-4, -1) $\cup$ (1, 4) 4) (-4, 4)

102. If a, b, c are distinct & the roots of $(b - c)x^2 + (c - a)x + (a - b) = 0$ are equation, then a, b, c are in (2015 A.P.)

1) A.P. 2) G.P. 3) H.P. 4) AGP

103. For real values of x, the range of $\frac{x^2+2x+1}{x^2+2x-1}$ is (2015 A.P)

1) $(-\infty, 0) \cup (1, \infty)$ 2) $\left[\frac{1}{2}, 2\right]$ 3) $\left(-\infty, \frac{-2}{9}\right) \cup (1, \infty)$ 4) $(-\infty, -6) \cup (-2, \infty)$

104. The number of real roots $|x|^2 - 5|x| + 6 = 0$ is (2016)

1) 2 2) 3 3) 4 4) 1

105. If α, β are the roots of $x^2 - x + 1 = 0$ then the quadratic equation whose roots are $\alpha^{2015}, \beta^{2015}$ is (2016)

1) $x^2 - x + 1 = 0$ 2) $x^2 + x + 1 = 0$
3) $x^2 + x + 1 = 0$ 4) $x^2 - x - 1 = 0$

106. If $12^{4+2x^2} = \left(24\sqrt{3}\right)^{3x^2-2}$ then x = (2016AP)

1) $\pm\sqrt{\frac{13}{12}}$ 2) $\pm\sqrt{\frac{14}{5}}$ 3) $\pm\sqrt{\frac{12}{13}}$ 4) $\pm\sqrt{\frac{5}{14}}$

107. The product & sum of the roots of the equation $|x^2| - 5|x| - 24 = 0$ are respectively (2016AP)

1) -64, 0 2) -24, 5 3) 5, -24 4) 0, 72

108. If α & β are the roots of the equation $ax^2 + bx + c = 0$ & the equation having roots $\frac{1-\alpha}{\alpha}$ & $\frac{1-\beta}{\beta}$ is $px^2 + qx + r = 0$, then r = (2017)

1) a + 2b 2) ab + bc + ca 3) a + b + c 4) abc

109. If $\left|\frac{x^2+kx+1}{x^2+x+1}\right| < 3$ for all real x, then k is in the interval (2017AP)

1) $(-\infty, -1)$ 2) (-1, 6) 3) (-1, 5) 4) $(6, \infty)$

KEY

1) 3	2) 3	3) 4	4) 4	5) 4	6) 1	7) 1	8) 4	9) 1	10) 1
11) 1	12) 3	13) 3	14) 2	15) 1	16) 3	17) 1	18) 1	19) 1	20) 1
21) 1	22) 2	23) 4	24) 1	25) 2	26) 3	27) 2	28) 4	29) 1	30) 3
31) 2	32) 4	33) 3	34) 1	35) 1	36) 4	37) 4	38) 1	39) 2	40) 1
41) 3	42) 1	43) 3	44) 2	45) 3	46) 1	47) 2	48) 4	49) 1	50) 3
51) 2	52) 2	53) 4	54) 1	55) 4	56) 1	57) 3	58) 4	59) 2	60) 3
61) 1	62) 4	63) 2	64) 3	65) 2	66) 4	67) 2	68) 4	69) 3	70) 1
71) 2	72) 1	73) 3	74) 4	75) 1	76) 1	77) 1	78) 4	79) 2	80) 3
81) 2	82) 4	83) 2	84) 2	85) 3	86) 4	87) 4	88) 4	89) 3	90) 2
91) 4	92) 4	93) 4	94) 4	95) 1	96) 1	97) 2	98) 3	99) 1	100) 3
101) 3	102) 1	103) 1	104) 3	105) 1	106) 2	107) 1	108) 3	109) 3	110)

EXERCISE-B

1. If α, β are the roots of $ax^2 + bx + c = 0$ then $(\alpha/\beta - \beta/\alpha)^2$ =

   1) $\frac{b^2(b^2-4ac)}{c^2a^2}$ 2) $\frac{b^2(b^2-4ac)}{ca^3}$

   3) $\frac{b^2(b^2-4ac)}{a^4}$ 4) $\frac{b^2(b^2-4ac)}{c^4}$

2. $\frac{x-1}{4x+5} < \frac{x-3}{4x-3} \Rightarrow x \in \ldots.$

   1) $-5/4 < x < 3/4$ 2) $-3/4 < x < 5/4$ 3) $-3 < x < 5$ 4) $-5 < x < 3$

3. If ω is acomplex cube root of unity, the equation whose roots are $2\omega+3\omega^2$ is

   1) $x^2+5x+7=0$ 2) $x^2+5x-7=0$ 3) $2-5x+7=0$ 4) $x^2-5x-7=0$

4. The difference of the roots of $x^2-bx+c=0$ is same as the difference of the roots of $x^2-cx+b=0$ if $b \neq c$ = then $b+c$ =____

   1) -1 2) -2 3) -3 4) -4

5. If one root of the equation $x^2+px+12=0$ is 4, while the equation $x^2+px+q=0$ has equal roots, then q=

   1) 49/4 2) 9/4 3) 4/49 4) 4/9

NOTE: The turning point on the graph of $y = ax^2 + bx + c$ has the coordinates $\left(\frac{-b}{2a}, \frac{4ac-b^2}{4a}\right)$.

6. The coordinates of the turning point of $y = 3x^2 + 4x - 1$ are

1) $\left(\frac{-2}{3},\frac{7}{3}\right)$ 2) $\left(\frac{-2}{3},\frac{-7}{3}\right)$ 3) $\left(\frac{2}{3},\frac{-7}{3}\right)$ 4) $\left(\frac{2}{3},\frac{7}{3}\right)$

NOTE: If the roots of the equation $x^2+px+q = 0$ be equal to ratio of the roots of $x^2+lx+m = 0$

then $\frac{p^2}{l^2} = \frac{q}{m}$.

7. If the roots of the equation $x^2+ax+18 = 0$ be equal to ratio of the roots of $x^2+2x+2 = 0$ then a =

1) ±3 2) ±6 3) ±8 4) ±4

KEY

1) **1**	2) **1**	3) **1**	4) **4**	5) **1**	6) **2**	7) **2**			

AIEEE PROBLEMS

1. If the roots of the quadratic equation $x^2 + px + q = 0$ are tan 30^0 and tan 15^0, respectively then the value of $2 + q - p$ is [2006]

1) 0 2) 1 3) 2 4) 3

2. All the values of m for which both roots of the equation $x^2 - 2mx + m^2 - 1 = 0$ are greater than –2 but less than 4, lie in the given by [2006]

1) $-1 < m < 3$ 2) $1 < m < 4$ 3) $-2 < m < 0$ 4) $m > 3$

3. The value of 'a' for which one root of the quadratic equation $(a^2 - 5a + 3)x^2 + (3a - 1)x+2=0$ is twice as large as the other, is [2003]

1) –2/3 2) 1/3 3) –1/3 4) 2/3

4. If both the roots of the quadratic equation $x^2 - 2kx + k^2 + k - 5 = 0$ are less than 5, then k lies in the interval [2005]

1) (5, 6) 2) (6, ∞) 3) (–∞, 4) 4) [4, 5]

5. If roots of the equation x2–bx+c = 0 be two consecutive integers, then $b^2 - 4c$ equals [2005]

1) –2 2) 3 3) 2 4) 1

6. If the difference between the roots of the equation $x^2 + ax + 1 = 0$ is less than √5, then the set of possible values of a is [2007]

1) (–3, 3) 2) (–3, ∞) 3) (3, ∞) 4) (–∞, –3)

7. The value of a for which the sum of the squares of the roots of the equation $x^2-(a-2)x-a-1=0$ assume the least value is [2005]

1) 0 2) 1 3) 2 4) 3

KEY

1) 4	2) 1	3) 4	4) 3	5) 4	6) 1	7) 2			

4. THEORY OF EQUATIONS

Relation between the roots and coefficients of a polynomial equation:

1. The polynomial $f(x) = x^n + p_1x^{n-1} + p_2x^{n-2} + \ldots + p_n$ is called standard form of nth degree polynomial.

2. If the degree of a polynomial is o then it is called constant.
   If the degree of a polynomial is 1 then it is called linear equation.
   If the degree of a polynomial is 2 then it is called quadratic equation
   If the degree of a polynomial is 3 then it is called cubic equation
   If the degree of a polynomial is 4 then it is called biquadratic equation

3. If α,β are the roots of the equation $x^2+p_1x+p_2=0$, then $S_1 = \alpha+\beta = -P_1$ and $S_2 = \alpha\beta = P_2$

4. The equation having roots α,β is $x^2-(\alpha+\beta)x+\alpha\beta=0$ is $x^2-S_1x+S_2=0$

5. If α,β,γ are the roots of the equation $x^3+p_1x^2+p_2x+p_3=0$ then
   $S_1 = \alpha+\beta+\gamma = -p_1$, $S_2 = \alpha\beta+\beta\gamma+\gamma\alpha = p_2$, $S_3 = \alpha\beta\gamma = -p_3$

6. The equation having roots α,β,γ is $x^3-(\alpha+\beta+\gamma)x^2+(\alpha\beta+\beta\gamma+\gamma\alpha)x-(\alpha\beta\gamma)=0$
   or $x^3-Sx^2+S_1x-S_1=0$

7. If $\alpha,\beta,\gamma,\delta$ are the roots of the equation
   $x^4+p_1x^3+p_2x^2+p_3x+p_4=0$ then
   $S_1 = \alpha+\beta+\gamma+\delta = -p_1$, $S_2 = \alpha\beta+\alpha\gamma+\alpha\delta+\beta\gamma+\beta\delta+\gamma\delta = p_2$
   $S_3 = \alpha\beta\gamma+\alpha\beta\delta+\alpha\gamma\delta+\beta\gamma\delta = -p_3$, $S_4 = \alpha\beta\gamma\delta = p_4$

8. The equation having roots $\alpha,\beta,\gamma,\delta$ is $x^4-(\alpha+\beta+\gamma+\delta)x^3+(\alpha\beta+\alpha\gamma+\alpha\delta+\beta\gamma+\beta\delta+\gamma\delta)x^2-(\alpha\beta+\alpha\gamma+\alpha\delta+\beta\gamma+\beta\delta+\gamma\delta)x+\alpha\beta\gamma\delta=0$
   $\Rightarrow x^4-S_1x^3+S_2x^2-S_3x+S_4=0$.

9. Newtons Theorem :- If $\alpha_1, \alpha_2 \ldots A_n$ are the roots of $x^n+a_1x^{n-1}+a_2x^{n-2}+\ldots+a_n=0$
   then $S_1+a_1=0$
   $S_2+a_1S_1+2a_2=0$
   $S_3+a_1S_2+a_2S_1+3a_3=0$
   $S_4+a_1S_3+a_2S_2+a_3S_1+4a_4=0$

10. For cubic equation when the roots are in A.P. they are taken as $\alpha-\beta, \alpha, \alpha+\beta$
    In G.P. they are $\alpha/\beta, \alpha, \alpha\beta$
    In HP they are $1/(\alpha-\beta), 1/\alpha, 1/(\alpha+\beta)$

11. For a biquadratic equation the roots in A.P. are $\alpha-3\beta, \alpha-\beta, \alpha+\beta, \alpha+3\beta$
    In G.P. they are $\alpha/\beta^3, \alpha/\beta, \alpha\beta, \alpha\beta^3$
    In H.P. they are $1/\alpha-3\beta$, $1/\alpha-\beta$, $1/\alpha+\beta$, $1/\alpha+3\beta$

12. If the roots of $ax^3+bx^2+cx+d=0$ are in HP,then the mean root is -3c/b.

13. The condition that the roots of $ax^3+bx^2+cx+d=0$ may be in A.P. is
$2b^3+27a^2d=9abc$
In G.P. $ac^3=b^3d$
In H.P. $2c^3+27ad^3+9bcd$

14. The condition that one root of $ax^3+bx^2+cd+d=0$ may be the sum of the other two roots is $8a^2d+b^3=4abc$

15. The condition that the product of two of the roots of $ax^3+bx^2+cx+d=0$ may be -1 is $a(a+c)+d(b+d)=0$

16. If $\alpha+i\beta$ is a root of $f(x)=0$ then $\alpha-i\beta$ is also a root of $f(x)=0$

17. If $\alpha+\sqrt{\beta}$ is root of $f(x)=0$ then $\alpha-\sqrt{\beta}$ is also a root of $f(x)=0$

18. If the roots of the equation $f(x)=0$ are diminished by h then the transformed equation is $f(x+h)=0$

19. If the roots of $f(x)=0$ is increased by h then the equation is $f(x-h)=0$

20. The second term of $f(x)=a_0x^n+a_1x^{n-1}+\ldots+a_n=0$ can be removed by diminishing the roots by h when $h=-a_1/na_0$

21. If α, β, γ are the roots of $x^4=1$, then $(1-\alpha)(1-\beta)(1-\gamma)=4$

22. The condition that the equation $ax^4+4bx^3+6cx^2+4dx+e=0$
1)has its roots equal the pairs is $2b^3+a^2d=3abc$
2)has its roots all equal is $b^2=ac$, $b^3=a^2d$, $b^4=a^3cd$.

23. If α, β, γ are the roots of $ax^3+bx^3+cx+d=0$ then
$S_1=\alpha+\beta+\gamma=-b/a$
$S_2=\alpha^2+\beta^2+\gamma^2=(b^3-2ac)/a^2$
$S_3=\alpha^3+\beta^3+\gamma^3=(3abc-b^3-3a^3d)/a^3$

Exercise-A

1. The equation whose roots are 1,-1, 3 only is _____
1) $x^3-3x^2-x+3=0$ 2) $x^3-3x^2-x-3=0$ 3) $x^3-3x^2+x+3=0$ 4) $x^3+13x^2-x+3=0$

2. The equation whose roots are 1+2i, 1-2i, 4 and 2 is _____
1) $x^4-8x^3+29x^2-46x-40=0$ 2) $x^4-8x^3+25x^2-46x+40=0$
3) $x^4-8x^3-29x^2-46x-40=0$ 4) $x^4+8x^3-29x^2-46x+40=0$

3. The roots of $x^3-3x^2+2x=0$ are _____
1)-1, 1,2 2)2,1,1 3)0,1,2 4)2,0,-2

4. The roots of $x^3+2x^2-x-2=0$ are _____
1)-2,-1,-1 2)-2,-1,1 3)2,1,-1 4)2,1,1

5. The roots of $x^4-1=0$ are _____
1)1,-1,i ,-i 2) -1,-1,i ,-i 3)1,1,i,i 4)1,i,-i,1

6. If 2 is a root of $x^3-6x^2+3x+10=0$ then the other roots are _____
1)1,5 2)1,-5 3)-1,5 4)-1,-5

7. The roots of $3x^3-4x^2+x+88=0$, one root being $2+\sqrt{7}\,i$ are_____
1)$2+\sqrt{7}\,i$, $2-\sqrt{7}i$,-8/3 2) 1)$2-\sqrt{7}\,i$, $2-\sqrt{7}i$,-8/3
3) 1)$2+\sqrt{7}\,i$, $2-\sqrt{7}i$,-6/3 4) $2+\sqrt{7}\,i$, $2-\sqrt{7}i$,-3/8

8. If the equation $x^3-5x^2+8x-4=0$ has a multiple root then it is _____
1)2 is a multiple root 2)3 is a multiple root
3) 4 is a multiple root 4) 1 is a multiple root

9. If 1, 1, α are the roots of $x^3-6x^2+9x-4=0$ then α = _____
1)2 2)3 3)4 45

Note: For cubic equation $\alpha^2+\beta^2+\gamma^2 = S_1^2-2S_2$
10. If α, β, γ are the roots of $x^3+x^2+x+1=0$ then $\alpha^2+\beta^2+\gamma^2$ = _____
1)1 2)-1 3)2 4)-2

11. If α, β ,γ are the roots of $x^3-x^2+33x+5=0$ then $\alpha^2+\beta^2+\gamma^2$=_____
1)65 2)-45 3)45 4)-65

Note: For a cubic equation $\alpha^3+\beta^3+\gamma^3 = S_1^3-3S_1S_2+3S_3$

12. If α, β, γ are roots of $x^3+qx+r=0$ then $\alpha^3+\beta^3+\gamma^3$ =_____
1)3r 2)4r 3)-3r 4)-4r

Note: For a biquadratic equation $\Sigma\,\alpha^2\beta = S_1S_2-3S_3$
13. If α, β ,γ, δ are roots of $x^4+2x^3+x^2+2x+1=0$ then $\Sigma\,\alpha^2\beta$ =_____
1)4 2)3 3)2 4)

14. If α, β, γ are roots of $x^3+3x+2=0$ then $\alpha(\beta+\gamma)+\beta(\gamma+\alpha)+\gamma(\alpha+\beta)$= _____
1)1 2)6 3)2 4)5
15. If the roots of $4x^3-12x^2+11x-3=0$ are in A.P then roots are _____
1)-1/2,1, 5/2 2)1/2,1,3/2 3)1/2,-1,3/2 4)-1/2,1,-3/2

16. If the roots of $2x^3-3x^2-11x+6=0$ are in A.P then roots are ____
1)1/2, 1/2,-1/5 2)-1/2,1/3,1/5 3)1/2,1/2,-6 4)-2,1/2,3

17. If the roots of $x^3-7x^2+14x-8=0$ are in G.P then roots are ____
1)-1,-2,-4 2)1,-2,4 3)1,2,4 4)-1,2,4

18. If the roots of $3x^3-26x^2+52x-24=0$ are in G.P then roots are
1)-1,1,3 2)1,1,-3 3)8/7,4/3,2 4)2/3,2,6

19. If the roots of $3x^3-22x^2+48x-32=0$ are in H.P then roots are ….
1)1/4,1/2,3/4 2)4,2,4/3 3)1/3,1/2,2/3 4)3,2,3/2

20. If the roots of $24x^3-26x^2+9x-1=0$ are in H.P then the roots are ____
1)1/2,1/3,1/4 2)1,1/3,1/5 3)1,0,-2 4)1,1,-2

21. If the roots of $x^3-9x^2+20x-12=0$ are in the ratio 1:3 then the roots are _____
1)1, 2, 6 2)2,6,3 3)1,3,4 4)3,1/3,12

22. The equation whose roots are diminished by 2 to the roots of equation $x^3-6x^2+11x-6=0$ is
1)$x^3-2=0$ 2)$x^3-x=0$ 3)$x^2-x=0$ 4)$x^3-4=0$

23. The equation whose roots exceed by 2 to the roots of equation $x^3+6x^2+11x+6=0$ is
1) $x^3-2=0$ 2)$x^3-x=0$ 3)$x^2-x=0$ 4)$x^3-4=0$

24. The equation whose roots are the reciprocals of the roots of the equation $x^5+12x^4+11x^3+8x^2-7x+4=0$ is _____
1)$4x^5-7x^4+8x^3+11x^2+12x+1=0$ 2) $4x^5-5x^4+18x^3+11x^2+2x+1=0$
3) $x^5-7x^4+x^3+11x^2+x+1=0$ 4) $x^5-x^4+x^3+11x^2+x+1=0$

25. The transformed equation after removing the second term of the equation $x^3-6x^2+10x-3=0$ is
1) $x^3-2x^2+1=0$ 2)$x^3-2x+1=0$ 3)$x^4-2x^2-1=0$ 4)$x^3+3x^2-1=0$

26. The transformed equation after removing the 2nd term of the equation $x^4+4x^3+2x^2-4x-2=0$ is
1) $x^4-24x^2+51=0$ 2) $x^4-54x^2+1=0$ 3) $x^4-4x^2+21=0$ 4) $x^4-4x^2+1=0$

27. If α, β, γ are the roots of $3x^3-5x^2-7x+1=0$ then the equation whose roots are -α, -β, -γ is
1)$3x^3+5x^2-7x-1=0$ 2) $x^3+x^2-x-1=0$ 3) $3x^3+15x^2-7x-21=0$ 4) $3x^3+x^2-7x-71=0$

28. The equation whose roots are multiplied by 3 of those of $2x^3-3x^2+4x-5=0$ is ____
1) $x^3-x^2+x-13=0$ 2) $12x^3-9x^2+6x-135=0$
3) $x^3-x^2+36x-5=0$ 4) $2x^3-9x^2+36x-135=0$

29. The transformed equation with integer coefficient and unity for the coefficient of first term of those of $3x^4-5x^3+x^2-x+1=0$ is_____
1)$x^4-5x^3+3x^2-9x+27=0$ 2) $x^4-5x^3+x^2-x+2=0$
3) $x^4-x^3+x^2-9x+1=0$ 4) $x^4-x^3+3x^2-9x+7=0$

30. The number of positive roots of $x^3-7x-7=0$ is _____
1)2 2)only 1 +ve root 3) only 2 +ve root 4)none

31. The number of negative roots of $x^3-7x-7=0$ is _____
1)2 –ve roots 2)only 1 +ve root 3) only 2 +ve root 4)none

32. The Cardan's equation of $x^3-3x^2+12x+16=0$ is _____
1) $x^3+49x+26=0$ 2) $x^3+9x+6=0$ 3) $x^3+x+26=0$ 4) $x^3+9x+26=0$

33. By Cardan's method the solution of $x^3-27x+54=0$ are _____
1)3,2,6 are roots 2)3,3,-6 are roots 3)1,2,3 are roots 4)3,3,6 are roots

34. If $p\pm iq$, $q\pm ip$ are the roots of $x^4-6x^3+18x^2-30x+25=0$ then (p, q)=____
1)p=1,2;q=2,1 2) p=1,2;q=2,23) p=2,2;q=2 4)none

Note: To remove 3rd term from $a_0x^3 + a_1x^2 + a_2x = 0$, find h by taking
$nC_2\, a_0\, h^2 + (n-1)a_1h + a_2 = 0$

35. The transformed equation after removing the 3rd term of $x^3+2x^2+x+1=0$ is _____
1)$-x^3-x^2+1=0$ 2)$x^3-x^2+1=0$ 3)$x^3+x^2+1=0$)$x^3-x^2-1=0$

36. The equation whose roots are the squares of the roots of the equation
$x^3-9x^2+23x-15=0$ is _____
1)$y^3-35y^2+259y-225=0$ 2)$y^3+35y^2+259y-225=0$
3)$y^3-35y^2+259y+225=0$ 4)$y^3-35y2-259y-225=0$

37. The equation whose roots are the squares of the roots of the equation
$x^3-3x^2+2x=0$ is _____
1)$-y^3-5y^2+4y=0$ 2)$y^3+5y^2+4y=0$ 3)$y^3-5y^2-4y=0$ 4)$y^3-5y^2+4y=0$

38. The equation whose roots are double to the roots of $x^3-6x^2+11x-6=0$ is _____
1)$y^3-12y^2+44y+48=0$ 2)$y^3+12y^2+44y-48=0$
3)$y^3-12y^2+44y-48=0$ 4)$-y^3-12y^2+44y-48=0$

39. The equation whose roots are triple to the roots of $x^4-10x^3+35x^2-50x+24=0$ is ___
1)$y^4+30y^3+315y^2-1350y+1944=0$ 2)$y^4-30y^3+315y^2-1350y+1944=0$
3)$y^4-30y^3-315y^2-1350y+1944=0$ 4)$y^4-30y^3+315y^2+1350y+1944=0$

40. I: The quotient and remainder of $x^4-6x^3+3x^2+26x-24$ when divided by x-4 are $x^3-2x^2-5x+6,0$.
II: The quotient and remainder of $2x^5-3x^4+5x^3-7x^2+3x-4$ when divided by x-2 are $2x^3+x^2+7x+17,30$.
1) only I is true 2)only II is true 3)both I and II are true 4)neither I nor II true

41. If A, B, C are the remainders of $x^3-3x^2-x+5, 3x^4-x^3+2x^2-2x-4$, $2x^5-3x^4+5x^3-7x^2+3x-4$ when divided by x+1,x+2,x-2 respectively then the ascending order of A, B, C is

1)A,B,C 2)B,C,A 3)A,C,B 4)B,A,C

42. A: The number of roots of $x^4+2x^3-7x^2-8x+12=0$ is 4.
R: Every algebraic equation of degree n has n roots and no more.
1) Both A and R are true and R is the correct explanation of A
2) Both A and R are true but R is not correct explanation of A
3) A is true but R is false 4) A is false but R is true.

43. Match the following.

Equation	Roots
I. $x^3-3x^2-16x+48=0$	a)6,4,-1
II. $x^3-7x^2+14x-8=0$	b)1,1/3,1/5
III. $15x^3-23x^2-9x-1=0$	c)1,2,4
IV. $x^3-9x^2+14x+24=0$	d)4,-4,3

1)c,d,a,b 2)d,c,b,a 3)c,a,b,d 4)c,b,a,d

PREVIOUS EAMCET PAPERS PROBLEMS

44. The roots of the equation $x^3-14x^2+56x-64=0$ are in _____progression
1)A.G.P 2)H.P 3)A.P 4)G.P [2001]

45. The equation whose roots are opposite in sign and equal in magnitude to the roots of $x^7+3x^5+x^3-x^2+7x+2=0$ is _____ [2001]
1) $x^7+3x^5+x^3+x^2+7x+12=0$ 2) $x^7+3x^5+x^3+x^2+7x-2=0$
3) $x^7+3x^5+x^3+3x^2+7x+2=0$ 4) $x^7+3x^5+x^3+x^2+27x+21=0$

46. Each of the roots of the equation $x^3-6x^2+6x-5=0$ are increased by k so that the new transformed equation does not contain x^2 term then k=_ [2001]
1)1/3 2)1/2 3)1 4)-2

47. The biquadratic equation whose roots are $1+i, 1-\sqrt{2}$ is _____ [2001]
1)$2x^4-4x^3+x^2-2x-2=0$ 2) $x^4-x^3+5x^2-x-2=0$
3) $x^4-4x^3+5x^2-2x-2=0$ 4) $5x^4-4x^3+x^2-2x-2=0$

48. If there is a multiple of order 3 for the equation $x^4-2x^3+2x-a=0$ then the other root is ____ (2001)
1)-1 2)0 3)1 4)2

49. If α,β,γ are the roots of $x^3+ax^2+bx+c=0$ then $\alpha^{-1}+\beta^{-1}+\gamma^{-1}$=___ [2002]
1)c/b 2)b/c 3)-b/c 4)-c/b

50. If $(1+\sqrt{3}i)/2$ is a root of the equation $x^4-x^3+x-1=0$ then its real roots are _____
1)1,-1 2)1,2 3)1,3 4)1,5 [2002]

51. If α,β,γ are the roots of the equation $2x^3-2x-1=0$ then $(\sum\alpha\beta)^2$=_____
1)2 2)1 3)3 4)4 [2002]

52. To remove the second term of the equation $x^4-3x^3+x^2-x+3=0$ diminish the roots of the equation: (2002)
1)1 2)2 3)3 4)4

53. The maximum numbers of real roots of the equation $x^5-6x^2-4x+5=0$ is ___(2002)
1)3 2)4 3)5 4)0

54. If the sum of the two roots of $x^3+px^2+qx+r=0$ is zero, then pq=___[2003]
1)-r 2)r 3)2r 4)-2r

55. If α, β, γ are the roots of the equation $x^3 + 4x + 1=0$ then $(\alpha+\beta)^{-1} + (\beta+\gamma)^{-1} + (\gamma+\alpha)^{-1}$=_____ [2003]
1)2 2)3 3)4 4)5

56. Let a≠0 and p(x) be a polynomial of degree greater than 2. If p(x) leaves remainder 'a' and '-a' when divided respectively by x+a and x-a then the remainder when p(x) is divided by x^2-a^2 is ____ (2003)
1)2x-3/4 2)-2x 3)x 4)-x

57. If f(x) is polynomial of degree n with rational coefficient and 1+2i, 2-√ 3 and 5 are three roots of f(x)=0 then least value of x is _____ [2004]
1)5 2)3 3)4 4)15

58. α,β,γ are the roots of $x^3-10x^2 +7x +8 =0$. Match the following and choose the correct answer. (2004)

I. $\alpha+\beta+\gamma$	a)-43/4
II. $\alpha^2 +\beta^2+\gamma^2$	b)-7/8
III. $1/\alpha +1/\beta +1/\gamma$	c)86
IV. $\alpha/ \beta\gamma +\beta/\gamma\alpha +\gamma/\alpha\beta$	d)0
	e)10

1)e,c,a,b 2)d,c,a,b 3)e,c,b,a 4)e,b,c,a

59. The roots of the equation $x^3-3x-2= 0$ are (2005)
1)-1,-1,2 2)-1,1,-2 3)-1,2,-3 4)-1,-1,-2

60. If α,β,γ are the roots of $x^3+2x^2-3x-1=0$, then $\alpha^{-2}+\beta^{-2}+\gamma^{-2}$= (2005)
1)12 2)13 3)14 4)15

61. The difference between two roots of the equation $x^3-13x^2+15x+189=0$ is 2. Then the roots of the equation are (2006)
1)-3,7,9 2)-3,-7,-9 3)3,-5,7 4)-3,-7,9

62. If α, β,γ are the roots of the equation $x^3-6x^2+11x+6=0$, then $\sum\alpha^2\beta +\sum\alpha\beta^2$=_____ (2006)
1)80 2)84 3)90 4)-84

63. If α,β,γ are the roots of $x^3-2x^2+3x-4=0$, then the value of $\alpha^2\beta^2+\beta^2\gamma^2+\gamma^2\alpha^2$ is
1) -7 2)-5 3)-3 4)0 (2007)

64. If 1,2,3 and 4 are the roots of the equation $x^4+ax^3+bx^2+cx+d=0$, then a+2b+c=
1)-25 2)0 3)10 4)24 (2007)

65. The sum of the 4th powers of the roots of the equation $x^3+x+1=0$ is
1)-2 2)-1 3)1 4)2 (2008)

66. The cubic equation whose roots are thrice to each of the roots of $x^3+2x^2-4x+1=0$ is (2008)
1) $x^3-6x^2+36x+27=0$ 2) $x^3+6x^2+36x+27=0$
3) $x^3-6x^2-36x+27=0$ 4) $x^3+6x^2-36x+27=0$

67. If α, β, γ are the roots of $x^3+4x+1=0$, then the equation whose roots are $\frac{\alpha^2}{\beta+\gamma},\frac{\beta^2}{\gamma+\alpha},\frac{\gamma^2}{\alpha+\beta}$ is : [2009]
1) $x^3-4x-1=0$ 2) $x^3-4x+1=0$
3) $x^3+4x-1=0$ 4) $x^3+4x+1=0$

68. If $f(x)=2x^4-13x^2+ax+b$ is divisible by x^2-3x+2, then (a, b) = [2009]
1) (–9, –2) 2) (6, 4) 3) (9, 2) 4) (2, 9)

69. The condition that the roots of $x^3-bx^2+cx+d=0$ are in geometric progression is : [2010]
1) $c^3=b^3d$ 2) $c^2=b^2d$ 3) $c=b\ d^3$ 4) $c=bd^2$

70. Let $\alpha\neq 1$ be a real root of the equation $x^3-ax^2+ax-1=0$, where $\alpha\neq -1$ is a real number. Then a root of the equation among the following is: [2010]
1) α^2 2) $-\frac{1}{\alpha}$ 3) $\frac{1}{\alpha}$ 4) $-\frac{1}{\alpha^2}$

71. If α and β are the roots of $x^2-2x+4=0$, then the value of $\alpha^6+\beta^6$ is: [2009]
1) 32 2) 64 3) 128 4) 256

72. If α,β,γ are the roots of the equation $x^3+px^2+qx+r=0$ then the coefficient of x in the cubic equation whose roots are $\alpha(\beta+\gamma),\beta(\gamma+\alpha)\ and\ \chi(\alpha+\beta)$
[2012]
1) 2q 2) q^2+pr 3) p^2-qr 4) r(pq – r)

73. If the roots of $x^3-42x^2+336x-512-0$, are in increasing geometric progression, then its common ratio is
[2013]
1) 2 2) 3 3) 4 4) 6

74. If α & β are the roots of the equation $x^2 - 2x + 4 = 0$, then $\alpha^9 + \beta^9 =$ [2013]

1) -2^8 2) 2^9 3) -2^{10} 4) 2^{10}

75. If p & q are distinct prime numbers & if the equation $x^2 - px + q = 0$ has positive integers as its roots then the roots of the equation are (2014)

1) 2, 3 2) 1, 2 3) 3, 1 4) 1, -1

76. The cubic equation whose roots are the suares of the order of $x^3 - 2x^2 + 10x - 8 = 0$ (2014)

1) $x^3 + 8x^2 + 68x - 64 = 0$ 2) $x^3 + 16x^2 - 68x - 64 = 0$
3) $x^3 - 16x^2 + 68x - 64 = 0$ 4) $x^3 + 16x^2 + 68x - 64 = 0$

77. Let α, β, γ be the roots of $x^3 + x + 1 = 0$ write $\alpha_1 = \frac{\alpha+\beta}{\gamma^2}, \beta_1 = \frac{\beta+\gamma}{\alpha^2}, \gamma_1 = \frac{\gamma+\alpha}{\beta^2}$

then the value of $\left(\alpha_1^3 + \beta_1^3 + \gamma_1^3\right) - \frac{1}{10}\left(\alpha_1^2 + \beta_1^2 + \gamma_1^2\right)$ (2015)

1) $\frac{1}{10}$ 2) $\frac{1}{5}$ 3) $\frac{3}{10}$ 4) $\frac{1}{2}$

78. Suppose α, β, γ are the roots of $x^3 + x^2 + x + 2 = 0$ then the value of

$\left(\frac{\alpha+\beta-2\gamma}{\gamma}\right)\left(\frac{\beta+\gamma-2\alpha}{\alpha}\right)\left(\frac{\gamma+\alpha-2\beta}{\beta}\right)$ is (2015)

1) $-\frac{47}{2}$ 2) $\frac{47}{2}$ 3) -47 4) 47

79. If the roots of $x^3 - kx^2 + 14x + 8 = 0$ are geometric progression, then k = (2015 A.P)

1) -3 2) 7 3) 4 4) 0

80. If the harmonic mean of the root of $\sqrt{2}x^2 - bx + \left(8 - 2\sqrt{5}\right) = 0$ is 4, then the value of b = (2015 A.P)

1) 2 2) 3 3) $4 - \sqrt{5}$ 4) $4 + \sqrt{5}$

81. If α, β, γ are roots of $x^3 - 5x + 4 = 0$ then $(\alpha^3 + \beta^3 + \gamma^3) =$ (2016)

1) 12 2) 13 3) 169 4) 144

82. Suppose α, β, γ are roots of $x^3 + x^2 + 2x + 3 = 0$. If f(x) = 0 is a cubic polynomial equation whose roots are $\alpha + \beta, \beta + \gamma, \gamma + \alpha$ then f(x) = (2016)

1) $x^3 + 2x^2 - 3x + 1$ 2) $x^3 + 2x^2 - 3x + 1$
3) $x^3 + 2x^2 + 3x - 1$ 4) $x^3 + 2x^2 + 3x + 1$

83. The number of real roots of the equation $x^5 + 3x^2 + 4x + 30 = 0$ is (2016AP)

1) 1 2) 2
3) 3 4) 5

84. If the coefficients of the equation whose roots are k times the roots of the equation $x^3+\frac{1}{4}x^2-\frac{1}{16}x+\frac{1}{144}=0$, are integers than a possible value of k is (2016AP)

1) 3 2) 12 3) 9 4) 4

85. The product of the real roots of $x^2-8x+9-\frac{8}{x}+\frac{1}{x^2}=0$ is (2017)

1) 2 2) 1 3) 3 4) 7

86. α & β are the roots of $x^2 + 2x + C = 0$. If $\alpha^3+\beta^3=4$, then the value of C is (2017)

1) – 2 2) 3 3) 2 4) 4

87. If α, β, γ are the roots of the equation $x^3 - 6x^2 + 11x + 6 = 0$, then $\sum\alpha^2\beta+\sum\alpha\beta^2=$

1) 72 2) 84 3) 90 4) 96 (2017AP)

88. If the roots of the equation $x^3 + 3px^2 + 3qx - 8 = 0$ are in a geometric progression, then $\frac{q^3}{p^3}=$

(2017AP)

1) 1 2) – 2 3) 4 4) – 8

KEY

1) **1**	2) **2**	3) **3**	4) **3**	5) **2**	6) **1**	7) **1**	8) **1**	9) **3**	10) **2**
11) **4**	12) **3**	13) **1**	14) **2**	15) **2**	16) **4**	17) **3**	18) **4**	19) **2**	20) **1**
21) **1**	22) **2**	23) **2**	24) **1**	25) **2**	26) **4**	27) **1**	28) **4**	29) **1**	30) **2**
31) **1**	32) **4**	33) **2**	34) **1**	35) **2**	36) **1**	37) **4**	38) **3**	39) **2**	40) **1**
41) **3**	42) **1**	43) **2**	44) **4**	45) **2**	46) **4**	47) **3**	48) **1**	49) **3**	50) **1**
51) **4**	52) **1**	53) **2**	54) **1**	55) **2**	56) **1**	57) **1**	58) **4**	59) **1**	60) **2**
61) **1**	62) **2**	63) **1**	64) **3**	65) **4**	66) **4**	67) **3**	68) **3**	69) **1**	70) **3**
71) **3**	72) **2**	73) **3**	74) **3**	75) **2**	76) **3**	77) **3**	78) **1**	79) **2**	80) **3**
81) **4**	82) **3**	83) **1**	84) **2**	85) **1**	86) **2**	87) **2**	88) **4**	89)	90)

EXERCISE-B

1. The value of k so that $x^4-3x^3+5x^2-33x+k$ is divisible by x^2-5x+6 is

1) 45 2) 48 3) 51 4) 54

2. If x^2-3x+2 is a factor of x^4-px^2+q then (p,q) =

1) (3,4) 2) (4,5) 3) (4,3) 4) (5,4)

3. If $\sqrt{5}+\sqrt{2}$ is a root of $3x^5-4x^4-42x^3+56x^2+27x-36=0$ then the rational root is

1) $\frac{4}{3}$ 2) $\frac{3}{4}$ 3) $-\frac{3}{4}$ 4) $-\frac{4}{3}$

4. If the roots of $x^3-9x^2+kx+l=0$ are in A.P with common difference 2 then (k,l)=

1) (15,-15) 2) (23,-15) 3) (15,-23) 4) (-15,23)

5. If two of the roots of $2x^3-3x^2-3x+2=0$ are differ by 3 then roots are

1) -1, $\frac{1}{3}$,2 2) $-\frac{3}{2},-\frac{4}{3},-\frac{5}{3}$ 3) -1, $\frac{1}{2}$2 4) 2, 2, -1

6. If -1 + i is a root of $x^4+4x^3+5x^2+2x+k=0$ then the other roots are

1) -1, -1 2) $-\frac{1}{2},-\frac{3}{2}$ 3) $-1\pm\sqrt{2}$ 4) $1\pm\sqrt{2}$

7. If the sum of two of the roots of $x^4-2x^3-3x^2+10x-10=0$ is zero then the roots are

1) $\pm\sqrt{5},1\pm i$ 2) $\pm\sqrt{5},1,-1$ 3) $\frac{1}{2},-\frac{1}{5},\pm1$ 4) $\sqrt{2},\sqrt{5},\pm2$

8. If $x^4-5x^3+9x^2-7x+2=0$ has a multiple root of order 3 then the roots are

1) 1, 1, 1, 2 2) 1, 2, 2, 2 3) -1, -1, -1, 2 4) 1, -2, -2, -2

9. If α,β,γ are the roots of $x^3+qx+r=0$ then $\frac{1}{\alpha+\beta-\gamma}+\frac{1}{\beta+\gamma-\alpha}+\frac{1}{\gamma+\alpha-\beta}=$

1) $\frac{q}{2r}$ 2) $\frac{q}{r}$ 3) $\frac{2q}{r}$ 4) $-\frac{2q}{r}$

10. The equation whose roots exceed by 2 than the roots of $4x^4+32x^3+83x^2+76x+21=0$ is

1) $4x^4+13x^2+9=0$ 2) $4x^4-13x^2+9=0$ 3) $4x^4+12x^2-0$ 4) $4x^4-13x^2-9=0$

11. Atleast one root $x^3-7x+7=0$ lies between

1) 0, 1 2) 1, 2 3) -4, -3 4) -1, 0

12. The number of positive real root of $x^4-4x-1=0$ is

1) 3 2) 2 3) 1 4) 0

13. If $f(x) = 2x^4-7x^3+ax+b$ is divisible by (x-1) & (x-2), then (a,b)=

1) (19,-14) 2) (19,14) 3) (-19,14) 4) (-19,-14)

14. If α, β, γ are the roots of a cubic equation satisfying the relations $\alpha+\beta+\gamma=2$, $\alpha^2+\beta^2+\gamma^2=6$ & $\alpha^3+\beta^3+\gamma^3=8$ then the equation is

1) $x^3+2x^2-x+1=0$ 2) $x^3-2x^2-x+1=0$
3) $x^3-2x^2+x+1=0$ 4) $x^3-3x^2-x+1=0$

15. If $\sqrt{5}+\sqrt{2}$ is a root of $3x^5-4x^4-42x^3+56x^2+27x-36=0$ then the rational root is

1) $\frac{4}{3}$ 2) $\frac{3}{4}$ 3) $\frac{-3}{4}$ 4) $-\frac{4}{3}$

16. The equation whose roots are reciprocals of the roots of $x^4+3x^3-6x^2+2x-4=0$ is $px^4+qx^3+rx^2+sx+1=0$, then q+r=

1) 5 2) 4 3) -4 4) -3

17. If α, β, γ are the roots of $x^3+2x+1=0$, then the equation whose roots are $\frac{\alpha^2}{\beta+\gamma}, \frac{\beta^2}{\gamma+\alpha}, \frac{\gamma^2}{\alpha+\beta}$

1) $x^3-2x+1=0$ 2) $x^3+2x+1=0$ 3) $x^3+2x+1=0$ 4) $x^3-2x+1=0$

18. If 2+I is a root of the eqution $x^3-5x^2+9x-5=0$, then the other roots are

1) 1, 2-i 2) -1, 3+i 3) 0,1 4) -1, i-2

19. The biquadratic equation $x^4+x^2+1=0$ has

1) All its roots real 2) All its roots imaginary
3) Two real roots & two imaginary roots
4) One positive root, one negative rppt & a pair or complex conjugate roots

20. If α is a positive root of the equation $x^4+x^3-4x^2+x+1=0$, then $\alpha+\frac{1}{\alpha}=$

1) 2 2) -2 3) 3 4) -4

KEY

1) 4	2) 4	3) 1	4) 2	5) 3	6) 3	7) 1	8) 1	9) 1	10) 2
11) 3	12) 3	13) 1	14) 2	15) 1	16) 3	17) 3	18) 1	19) 2	20) 1

5. PERMUTATIONS AND COMBINATIONS

1. An arrangement that can be formed by taking some or all of a finite number of things or objects is called a permutation.
   Note: The number of permutations that can be formed by taking 'r' things at a time from a set of n dissimilar things is denoted by ${}^{n}p_{r}$ or P(n,r).

2. $n_{p_1} = n$; $n_{p_2} = n(n-1)$; $n_{p_3} = n(n-1)(n-2)$, $n_{p_0} = 1$, $n_{p_n} = n!$
   $n_{p_r} = n$ (n-1)(n-2) ….. (n-r+1) = n! / (n-r)!
   ${}^{n}p_{r} = n.\ {}^{(n-1)}p_{(r-1)}$

3. The arrangements of objects around a circle is called circular permutation.

4. Each of the groups or selections that can be made by taking some or all of a number of things is called combination.
   Note:- The number of combinations of `n' dissimilar things taken 'r' at a time is denoted by n_{c_r} .

5. ${}^{n}c_{o} = 1$; ${}^{n}c_{1} = n$; ${}^{n}c_{2} = n(n-1)/1.2$; ${}^{n}c_{3} = n(n-1)(n-2)/1.2.3$
   $n_{c_r} = \dfrac{n!}{(n-r)!r!}$; ${}^{n}c_{n} = 1$

6. $n_{c_r} = {}^{n}c_{n-r}$

7. If ${}^{n}c_{r} = {}^{n}c_{s}$ then r = s or n = r + s.

8. ${}^{n}c_{r-1} + {}^{n}c_{r} = {}^{(n+1)}c_{r}$

9. $\dfrac{n_{c_r}}{n_{c_{r-1}}} = \dfrac{n-r+1}{r}$.

10. ${}^{n}p_{r} = r!\ {}^{n}c_{r}$

11. ${}^{n}p_{r} / {}^{n}p_{r-1} = n-r+1$

12. $n_{c_r} = \dfrac{n}{r}.\ {}^{(n-1)}c_{(r-1)}$

13. ${}^{n}\ {}^{(n-1)}c_{(r-1)} = (n-r+1)\ {}^{n}c_{(r-1)}$

14. There are n white, n black balls each set numbered 1 to n. The number of ways that the balls can be arranged in a row so that the adjacent balls are of different colours is $2(n!)^2$.

15. The number of ways of ranking n person so that a specified person 'x' is ranked after another specified person 'y' is n! / 2.

16. The number of ways of ranking 'n' persons so that a specified person A is ranked after specified person B and B is ranked after another specified person C is n! / 3!

17. Sum of the 'n' digited numbers formed by taking all the given 'n' digits (not including zero) is (sum of all the n digits) (111… ntimes) (n-1) !

18. Sum of the 'n' digited numbers formed by taking all the given 'n' digits (including 0) is (sum of the 'n' digits] [(n-1)!(1111… n times) – (n-2) !(111 …. (n-1) times)].

19. a) The number of circular permutations of 'n' different things is (n-1) !
    b) If no distinction is made between anti clock wise and clock wise arrangements then the number of permutations is (n-1) ! / 2

20. The number of circular permutations of 'n' different things taken 'r' at a time is ${}^{n}p_{r}$ / r .

21. There are 'n' letters and 'n' addressed envelops and the letters can be put into the envelops at random. The number of arrangements in which exactly 'r' letters will be placed in wrongly addressed envelops is
    ${}^{n}p_{r}$ [1-(1/1!) +(1/2!) –(1/3!)+…. + $(-1)^{r}$ (1/r!)]

22. Number of permutations of 'n' things taken all of a time when 'p' of them are alike and of one kind 'q' of them are alike and of a second kind 'r' of them are alike and a third kind and the rest are all different is
    n ! / (p ! q ! r !)

23. The number of ways that 'r' prizes can be distributed to 'n' students so that no student gets all the prizes is n^{r}-n

24. The total number of permutations of 'n' different things taken not more than 'r' at a time , when each thing may be repeated any number of times is n (n^{r-1}) / (n-1).

25. The number of diagonals of a polygon with 'n' sides is n(n-3) / 2

26. A set of 'm' parallel lines are intersected by another set of n parallel lines then the number of parallelograms are formed by these lines are ${}^{m}c_{2}$ x ${}^{n}c_{2}$

27. There are 'n' points in a plane and no three of them are collinear
    I) The number of straight lines be drawn by joining them is ${}^{n}c_{2}$

II) The number of triangles can be formed by joining these points is ${}^{n}c_{3}$

28. There are 'n' points in a plane no three of which are in the same straight line excepting 'm' points which are collinear.
a. The number of lines can be drawn is ${}^{n}c_{2} - {}^{m}c_{2}$
b. The number of triangles can be formed is ${}^{n}c_{3} - {}^{m}c_{3}$

29. I) The number of ways in which (I) m+n things can be divided into two different groups of 'm' and 'n' things is (m+n) ! / m ! n!
II) "m+n+p" things can be divided into three different groups say m, n and p things respectively is (m+n+p) ! / m ! n ! p!

30. The number of ways in which '2n' things can be divided into two equal groups of n things each is $(2n)! / 2!\,(n!)^2$ .Similarly 3n things can be divided into three equal groups is $(3n)! / 3!\,(n!)^3$

31. Total number of combinations of 'n' different things taken one or more at a time is $2^n - 1$.

32. The total number of ways of dividing 'n' identical things among 'r' persons each one of whom can receive 0,1,2 or more things is ${}^{(n+r-1)}c_{(r-1)}$

33. The total number of ways of dividing 'n' identical things among 'r' persons when each gets atleast one is ${}^{(n-1)}c_{(r-1)}$.

34. The total number of selections of 'r' things from 'n' things where each thing can be repeated as many as times as one can is ${}^{(n+r-1)}c_{r}$.

35. The number of positive integral solutions of the equation
$x_1 + x_2 + x_3 + \ldots + x_r = n$ is ${}^{(n-1)}c_{(r-1)}$

36. The number of diagonals of a polygon with 'n' sides is n (n-3) / 2

37. If $N = p^{n1}, P_2^{n2}.P_3^{n3}\ldots..P_k^{nk}$ (where $P_2, P_3, \ldots P_k$ are primes other than 2)
I) The number of even divisors
$= n_1(n_2+1)(n_2+1)\ldots..(n_k+1)$
ii) Number of odd divisors
$= (n_2+1)(n_3+1)\ldots.(n_k+1)$.

38. The number of ways in which N can be resolved as a product of 2 factors
i) $\frac{1}{2}(\alpha_1+1)(\alpha_2+1)\ldots\ldots(\alpha_4+1)$, if N is not a perfect square
ii) $\frac{1}{2}\{(\alpha_1+1)(\alpha_2+1)\ldots..(\alpha_k+1)+1\}$ if N is a perfect square
where $\alpha_1, \alpha_2, \ldots.\alpha_k$ are prime factors of N.

39. The sum of digits in unit places of all numbers formed with the help of $a_1, a_2, \ldots, a_n$ all at a time is $(n-1)!\ (a_1+a_2+\ldots a_n)$.

40. The number of ways of dividing Kn things into 'K' equal groups is $\frac{(kn)!}{(n!)^k.k!}$

41. The number of ways in which n different letters can be put in their n addressed envelopes so that all the letters are in the wrong envelopes is
$= n!\ [\ 1-1/1!+1/2!-1/3!+\ldots+(-1)^n\ 1/n!\ ]$

Exercise-A

1. If ${}^{n+1}C_3 = 4\,{}^nC_2$ then n =
1)4 2)5 3)6 4)7

2. If ${}^nC_4 = {}^nC_8$ then ${}^nC_2$ =
1)64 2)65 3)66 4)62

3. If ${}^nP_r = 720, {}^nC_r = 120$ then (n,r) =
1)7,4 2)6,2 3)8,4 4)10,3

4. If $n_{p_5} = n_{p_6}$ then n=
1)15 2)150 3)210 4)225

5. If $10_{p_r} = 5040$ then r=
1)5 2)150 3)4 4)225

6. If P(n,n) = 720 then n =
1)8 2)7 3)6 4)5

7. If P(4n,3) = 28. P(2n,2) then n =
1)5 2)4 3)3 4)2

8. A student has 4 paints and 6 shirts.The no. of ways in which a student can wear the dress in different combinations is
1)15 2)7 3) 6 4) 10

9. The number of words that can be formed with letters of the word "CORRESPONDENCE" is
1)14! 2)14! / $(2!)^3$ 3! 3)14! / $(2!)^4$ 3! 4)14! / $(2!)^2$ 3!

10. The number of ways one can arrange words with letters of the word MADHURI" so that always vowels occupy the beginning, middle and end place is
1)7! 2)P(3,3).P(4,3) 3)3.P(4,4) 4)3!4!

11. If ${}^{n}P_{r} = 720, {}^{n}C_{r} = 120$ then (n,r) =
1)7,4 2)6,2 3)8,4 4)10,3

12. The number of ways of selecting 6 clerks from 8 male & 7 female applications if the selection is to consist of either all males or all females is
1)25 2)30 3)35 4)40

13 he number of ways in which 6 boys and 6 girls are arranged in a row so that no two boys sit together and always row start with the boy is
1)$(6!)^2$ 2)P(7,6)6! 3)7!5! 4)P(7,6)7!

14. If two persons enter into a bus and if 6 seats are vacant then the number of ways they can occupy the seats is
1)30 2)60 3)120 4)360

15. The number of ways in which 7 ministers and 6 secretaries can sit around a table so that no two ministers are together is
1)7!7! 2)7!6! 3)6!6! 4)0

16. The number of ways in which 7 beads of different colours be strung as a necklace is
1)5040 2)2520 3)720 4)360

17. The sum of all 4 digit numbers formed with 1,2,3,4 without repetition is
1)60,000 2)55,550 3)66,660 4)56,660

18. The number of 10 digit numbers that can be formed by using the digits 1 and 2 is
1)46 2)C(10,2) 3)10! 4)2^{10}

19. The number of parallelograms that can be formed from a set of four parallel lines intersecting another set of three parallel lines is
1)18 2)12 3)9 4)6

20. A polygon has 20 diagonals, then the number of its sides are
1)7 2)8 3)9 4)11

21 If C(n, r-1)=20, C(n, r)=15, C(n, r+1)=6 then r=
1)3 2)4 3)5 4)6

22. The number of ways in which 3 prizes can be given away to 5 then each boy is eligible for only is prize is
1) $5p_3$ 2) $5c_3$ 3)3^5 4)5^3

23. In an assemble election idf 7 members are contesting for a single . Assembly constituency then how many ways can their names be printed on the ballat paper
1)5040 2)8!5!3! 3)3360 4)360

24. The number of quadratic expressions with the coefficients drawn from set {0,1,2,3} is
1)27 2)36 3)48 4)64

25. There are 8 types of pant pieces and 9 types of shirt pieces with a man. The number of ways a pair can be stitched by the tailor to him is
1)17 2)56 3)64 4)72

26. The number of divisors of 98,000(without 1 and itself) is
1) 58 2)60 3)24 4)48

27. 60 employees are there in a college. In how many ways can a cooperative committee with exactly 3 men and 2 women serve?
1) ${}^{55}C_8 \times {}^{5}C_2$ 2) ${}^{8}C_3 \times {}^{5}C_3$ 3)344 4)55

28. The number of triangles that can be formed by joining the vertices of a hexagon is
1)C(6,3) 2)P(6,3) 3)6. C(6,2) 4)C(6,3)-1

29. 10 different letters are given. Then the number of ways of forming words with 6 letters so that atleast one letter is repeated is
1)1,51,200 2)8,48,800 3)10^6 4)10^6-10^4

30. The number of ways of forming a committee of 5 members from 6 men and 4 women in which exactly 3 men and 2 women are there is
1)6 2)20 3)60 4)120

31. The number of ways a man can invite one or more of his friends for a dinner is
1)63 2)127 3)255 4)511

32. A letter lock contains 5 rings each marked with 4 different letters. The number of all possible unsuccessful attempts to open the lock is
1)625 2)1024 3)624 4)1023

33. There are 4 doors to a lecture room. The number of ways in which a student can enter the room and leave it by a different door is
1)12 2)10 3)18 4)20

34. The total number of signals that can be made with 7 different coloured flags is
1)128 2)7 3)127 4)14

35. Everybody in a room shakes hands with everyone else. The total number of hand shakes is 66. The total number of persons in the room is
1)11 2)12 3)13 4)14

36. The number of ways of arranging 6 players to throw the cricket ball so that oldest player may not throw first is

1)120 2)600 3)720 4)715

37. 9 articles are to be placed in 9 boxes. One in each box.5 of them are too big for 3 of the boxes. The number of possible arrangements is
1)17280 2)1728 3)720 4)none

38. A man has 4 sons and 8 schools within his reach. In how many ways he can send his sons to school, if no two of his sons are to read in the same school?
1)$^8P_4$ 2)$^6C_3$ 3)8^4 4)4^8

39. A family consisting of an old man, 6 adults and 4 children, is to be seated in a row for dinner. The children wish to occupy the two seats at each end and the old man refuses to have a child on either side of him. The number of ways that the seating arrangements can be made for the dinner is
1)84,410 2)85,405 3)85,400 4)86,400

40. The sum of numbers formed by taking all the digits 2,4,6,8 is
1)123320 2)13220 3)133320 4)none

41. 3 letters are to be posted in 5 letter boxes in a part of the town. If all the letters are not posted in the letter box, the number of ways of posting is
1)125 2)120 3)15 4)10

42. The number of ways of wearing 6 different rings to 5 hands is
1)5^6 2)5^5 3)2^6 4)2^5

43. If 8 persons are to address a meeting, then the number of ways in which a specified speaker is to speak before another specified speaker is
1)2520 2)20160 3)40320 4)5040

44. 20 persons were invited for a party. The number of ways that they can be arranged in a circle with the host is
1)15! 2)20! 3)12! 4)15!

45. The number of ways in which 8 men be arranged round a table so that 2 particular men may not be next to each other is
1)1440 2)5040 3)2520 4)3600

46. 7 women and 7 men are to sit round a circular table such that there is a man on either side of every woman. The number of seating arrangements is
1)$(7!)^2$ 2)$(6!)^2$ 3)6!7! 4)7!

47. Six teachers and 6 students have to sit around a circular table such that there is a teacher between any 2 students. The number of ways in which they can sit is
1)6!6! 2)5!6! 3)5!5! 4)none

48. If ${}^{n}c_{n-3} = 10$ then n =
1)4 2)5 3)6 4)7

49. If ${}^{(n+1)}C_3 = 4\ {}^{n}C_2$ then n =
1)12 2)10 3)7 4)11

50. The number of ways of painting the faces of a cube with 6 different colours is
1)1 2)6 3)6! 4)none

51. If ${}^{15}C_r = {}^{15}C_7$ then ${}^{r}C_5 =$
1)56 2)63 3)48 4)74

52. ${}^{14}C_4 + \sum_{j=1}^{4} {}^{(18-j)}C_3$
1) ${}^{14}C_5$ 2) ${}^{18}C5$ 3) ${}^{18}C_4$ 4) ${}^{19}C_4$

53. ${}^{47}C_4 + \sum_{j=1}^{52} {}^{(52-j)}C_3$
1) ${}^{52}C_4$ 2) ${}^{52}C_3$ 3) ${}^{53}C_4$ 4) ${}^{53}C_3$

54. The number of ways in which 7 players can be selected from a batch of 12 players so that 3 Particular players are always included and 2 particular players arte always excluded is
1)35 2)46 3)51 4)63

55. The number of ways that 6 questions can choose out of 9 questions so that the first and last questions are always included is
1)35 2)56 3)84 4)none

56. The number of non- negative integral solutions of $x_1+x_2+x_3+x_4 = n$, where 'n' is a positive integer is
1) ${}^{n}C_3$ 2) ${}^{(n+3)}C_3$ 3) ${}^{(n-3)}C_3$ 4) ${}^{(n-1)}C_3$

57. The number of ways of dividing 10 blocks into 3 groups of 5,3,2 books respectively is
1) $\frac{8!}{6!5!2!}$ 2) $\frac{9!}{5!4!3!}$ 3) $\frac{10!}{5!3!2!}$ 4) $\frac{12!}{7!5!2!}$

58 If six teachers and six students have to sit around a circular table so that there is a teacher between every two students, then the number of ways they can sit is
1)6!6! 2)5!6! 3)5!5! 4)6!6! / 2

59. From among 22 players the number of ways of selecting 11 players so that always

two players are included and 4 players are excluded is
1)C(16,11) 2)C(16,10) 3)C(16,9) 4)C(20,9)

60. A group contains 6 men and 3 women. A committee is to be formed with 5 people containing 3 men and 2 women. The number of different committees that can be formed is
1)$^9C_5$ 2)$^6C_3 x ^3C_2$ 3)$^6C_3$ 4)$^3C_2$

61. A committee of 5 is to be formed from 6 boys and 5 girls. The number of ways that the committee can be formed so that the committee contains at least one boy and one girl is
1)248 2)455 3)720 4)1025

62 Out of 6 gentlemen and 4 ladies a committee of 5 is to be formed. The number of ways in which this can be done so as to include exactly 2 ladies is
1)90 2)120 3)140 4)180

63. Out of 8 Mathematics, 6 Physics, 4 Chemistry books are to be selected. The number of ways in which this can be done so as to include at least one book from each subjects is
1) $^8C_5 \times ^6C_3 \times ^4C_3 + ^8C_5 \times ^6C_4 \times ^4C_2 \times ^8C_1 \times ^6C_3 \times ^4C_5$
2) $^8C_2 \times ^6C_3 \times ^4C_2 + ^8C_4 \times ^6C_1 \times ^4C_3 \times ^8C_5 \times ^6C_1 \times ^4C_3$
3) $^8C_4 \times ^6C_2 \times ^4C_3 + ^8C_2 \times ^6C_4 \times ^4C_2 \times ^8C_2 \times ^6C_3 \times ^4C_2$
4) $^8C_1 \times ^6C_1 \times ^4C_2 + ^8C_1 \times ^6C_2 \times ^4C_1 \times ^8C_2 \times ^6C_1 \times ^4C_1$

64. Jobs are vacant in an office. 8 men and 5 women have applied for these posts. In how many ways can these posts be filled such that men and women should be given equal number of posts?
1)$^8C_3$ X $^5C_2$ 2)$^8C_3$ X $^5C_3$ 3)344 4)45

65. The number of ways that a cricket 11 can be chosen out of a batch of 15 players so that a particular player excluded is
1)364 2)1001 3)1365 4)220

66. The number of ways in which 8 questions can be chosen out of 15 questions so that the first 5 questions are always included and the last 3 questions are always excluded is
1)35 2)210 3)343 4)2187

67. C (n,20) =C(n,8) then C(n,3)=
1)3276 2)540 3)56 4)28

68. P(n,r)=6720, C(n,r)=56 then n=
1)6 2)7 3)8 4)9

69. A box contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the box if atleast 1 black ball is to be included in the draw?
1)64 2)56 3)46 4)none

70. Out of 5 teachers and 8 students a committee of 6 is to be selected. The number of ways in which this can be done when there is a majority of teachers is
1)1008 2)246 3)542 4)680

71. The number of ways that a mixed doubles tennis game can be arranged from 7 married couples if no husband and wife play in the same game is
1)420 2)425 3)430 4)431

72. 27 passengers are to travel by a double decked bus which can accommodate 12 in the upper deck and 15 in the lower deck. The number of ways that these passengers are distributed if 10 refuse to sit in the lower deck and 10 refuse sit upper deck is
1)21 2)22 3)23 4)24

73. There are 3 routes from Tenali to Vijayawada and 4 routes from Vijayawada to Hyderabad, in how many different ways a person can travel from Tenali to Hyderabad via Vijayawada?
1)12 2)10 3)18 4)20

74. A student has 5 pants 8 shirts. The number of ways in which he can wear the dress in different combinations is
1) ${}^{8}P_{5}$ 2) ${}^{8}C_{5}$ 3) $8!\times 5!$ 4)40

75. There are 4 doors to a lecture room. The number of ways in which a student can enter the room and leave it by a different door is
1)12 2)10 3)18 4)20

76. If $n!$ =40320, then n =
1)24 2)12 3)8 4)23

77. A man has 3 sons and 6 schools within his reach. In how many ways he can send his sons to school, if no; two of his sons are to read in the same school?
1) ${}^{6}P_{3}$ 2) ${}^{6}C_{3}$ 3) 6^{3} 4) 3^{6}

78. The number of arrangements that can be formed by taking all the letters {*T, U, E, S, D, A, Y*}
1)720 2)5040 3)120 4)40320

79. The number of arrangements that can be formed by taking all the letters VICTORY that are to begin with Y is
1)24 2)120 3)720 4)30

80. The number of arrangements that can be formed by taking all the letters SQUARE that are to begin with S and end with E is
1)24 2)120 3)720 4)30

81. The number of arrangements that can be formed by taking all the letters {*M,A,G Z,,I,N,E*}
1)720 2)2520 3)120 4)6720

82. The number of arrangements that can be formed from the letters of the word *'TRIANGLE'* so that the relative positions of vowels and consonants remain unaltered is
1)360 2)180 3)720 4)none

83. The number of arrangements that can be formed by taking all the letters of the word *'EQUATION'* so that no; two vowels come together is
1)14,400 2)13,600 3)16,200 4)12,500

84. The number of 3 digited numbers that can be formed from {1,2,4,5,6,8,9}is
1)210 2)230 3)240 4)250

85. The number of 3 digited numbers that can be formed from {02,4,6,8}is
1)50 2)61 3)48 4)54

86. If a,b,c are the values of n where ${}^{n}P_{7}=42$ ${}^{n}P_{5}$,${}^{n}P_{4}=1680$,${}^{12}P_{n}=1320$ respectively then the ascending order of a,b,c is
1)a,b,c 2)b,c,a 3)c,b,a 4)c,a,b

87. A : If ${}^{n}P_{3}=2730$ then n=15.
R : ${}^{n}P_{r}=n!/(n-r)!$.
1)Both A and R are true R is correct explanation to A
2)Both A and R are true but r is not correct explanation to A
3)A is true R is false 4) A is false R is true

88 I: The number of ways of selecting a committee of 6 members out of 10 members always including a specified member is 126.
II: The number of ways of selecting 5 books from 9 different books such that a particular book is not included is 70.
1)only I is true 2)only II is true
3)both I and II are true 4)neither I nor II true

PREVIOUS EAMCET PAPERS PROBLEMS

89. The number of ways in which a man can invite one or more of his l8 friends to dinner is
1)28 2)128 3)240 4)255 (1985)

90 The number of ways in which a team of eleven players can be selected from 22

players always including 2 of them and excluding 4 of them is (1985)
1)$^{16}C_{11}$ 2)$^{16}C_5$ 3)$^{16}C_9$ 4)$^{20}C_9$

91. The number of positive divisors of $2^5 3^6 7^3$ is(1987)
1)14 2)167 3)168 4)166

92. A committee of 5 is to be formed from 6 boys and 5 girls. The number of ways that the committee can be formed so that the committee contains at least one boy and one girl is
1)248 2)455 3)720 4)1025 (1988)

93. In how many ways can 5 red and 4 white balls be drawn from a bag containing 10 red and 8 white balls? (1991)
1)$^8C_5 X^{10}C_4$ 2)$^{10}C_5 X^8C_4$ 3)$^{18}C_9$ 4)$8c_7$

94. How many different committees of 5 can be formed from 6 men and 4 women on which exactly 3 men and 2 women serve? (1995)
1)6 2)20 3)60 4)120

95. The number of ways of selections one or more out of 7 given things is (1996)
1)64 2)63 3)128 4)127

96. The number of lines that can be formed from 12 points in a plane of which no three of them are collinear except 6 points lie on a line is (1997)
1)45 2)52 3)50 4)46

97. If a polygon has 35 diagonals, then the number of sides of the polygon is (1997)
1)25 2)20 3)15 4)10

98. If $^{(2n+1)}P_{n-1}$: $^{(2n-1)}P_n$=3:5 then n= (1998)
1)4 2)5 3)6 4)3

99. A group contains 6 men and 3 women. A committee is to be formed with 5 people containing 3 men and 2 women. The number of different committees that can be formed is (1998)
1)$^9C_5$ 2)$^6C_3 X^3C_2$ 3)$^6C_3$ 4)$^3C_2$

100. If $^n P_7 = 42\ ^nP_5$, then n=_____(1999)
1)5 2)-1 3)7 4)12

101. The number of quadratic expressions with the coefficients drawn from the set {0,1,2,3 }is (2000)
1)27 2)36 3)48 4)64

102. The number of ways in which 13 gold coins can be distributed among three persons such that each one gets at least two gold coins is (2000)
1)36 2)24 3)12 4)6

103. If C(2n,3):C(n,2)=12:1, then n= (2000)
1)4 2)5 3)6 4)860.

104. The number of ways in which 5 boys and 4 girls sit around a circular table so that no two girls sit together is (2001)
1)5!4! 2)20! 3)12! 4)15!

105. Using the digits 0,2,4,6,8 not more than once in any number, the number of 5 digited numbers that can be formed is (2001)
1)16 2)24 3)120 4)96

106. The number of positive odd divisors of 216 is (2004)
1)4 2)6 3)8 4)12

107. The number of natural numbers less than 1000, in which no two digits are repeated is:
1)738 2)792 3)837 4)720 (2006)

108. Eight different letters of alphabet are given, words of four letters from these are formed: The number of such words with at least one letter repeated in: (2006)
1)(8/4) – $8p_4$ 2)8^4 + (8/4) 3)8^4 – $8p_4$ 4)8^4 – (8/4)

109. The number of ways of arranging 8 men and 4 women around a circular table such that no two women can sit together, is [2007]
1)8 2)4! 3)8!4! 4)7!$^8P_4$

110. If a polygon of n sides has 275 diagonals, then n = [2007]
1)25 2)35 3)30 4)15

111. 9 balls are to be placed in 9 boxes and 5 of the balls can not fit into 3 small boxes. The number of ways of arranging 1 ball in each of the boxes is [2008]
1)18720 2)18270 3)17280 4)12780

112. If n_{p_r} =30240 and n_{c_r} =252 then the ordered pair (n,r)= [2008]
1) (12, 6) 2) (10, 5) 3) (9, 4) 4) (16, 7)

113. The number of subsets of {1, 2, 3, …..,9} containing at least one odd number is:
1) 324 2) 396 3) 496 4)512 [2009]

114. p points are chosen on each of the three coplanar lines. The maximum number of triangles formed with vertices at these points is: [2009]
1) $p^3 + 3p^2$ 2) $\frac{1}{2}(p^3 + p)$ 3) $\frac{p^2}{2}(5p-3)$ 4) $p^2(4p-3)$

115. A binary sequence is an array of 0's and 1's. The number of n-digit binary

sequences which contain even number of 0's is [2009]

1) 2^{n-1} 2) $2^n - 1$ 3) $2^{n-1} - 1$ 4) 2^n

116. A polygon has 54 diagonals. Then the number of its sides is : [2010]

1) 7 2) 9 3) 10 4) 12

117. A bag contains n white & n black balls. Pairs of balls are drawn at random without replacement successively, until the bag is empty. If the number of ways in which each pair consists of one white and one black ball is 14, 400 then n = [2011]

1) 6 2) 5 3) 4 4) 3

118. The number of five digit numbers divisible by 5 that can be formed using the numbers 0, 1, 2, 3, 4, 5 without repetition is [2011]

1) 240 2) 216 3) 120 4) 96

119. $15_{P_8} = A + 8.\ 14_{P_7} \Rightarrow A =$ [2011]

1) 14_{P_6} 2) 14_{P_8} 3) 15_{P_7} 4) 16_{P_9}

120. A regular polygon of n sides has 170 diagonals. Then n = [2012]

1) 12 2) 17 3) 20 4) 25

121. A committee of 12 members is to be formed from 9 women and 8 men. The number of committees in which the women are in majority is [2012]

1) 2720 2) 2702 3) 2270 4) 2278

122. A student has to answer 10 out of 13 questions in an examination choosing at least 5 questions from the first 6 questions. The number of choices available to the student is [2012]

1) 63 2) 91 3) 161 4) 196

123. ${}^nC_{r-1} = 330,\ {}^nC_r = 462,\ {}^nC_{r+1} = 462 \Rightarrow r =$ [2013]

1) 3 2) 4 3) 5 4) 6

124. 10 men & 6 women are to be seated in a row so that no two women sit together. The number of ways they can be seated is: [2013]

1) 11! 10! 2) $\frac{11!}{6!5!}$ 3) $\frac{10!9!}{5!}$ 4) $\frac{11!10!}{5!}$

125. If t_n denotes the number of triangles formed with n points in a plane no three of which are collinear & if $t_{n+1} - t_n = 36$, then n = [2013]

1) 7 2) 8 3) 9 4) 10

126. Out of thirty points in a plane, eight of them are collinear. The number of straight lines that can be formed by joining these points is (2014)
1) 540 2) 408 3) 348 4) 296

127. $\sum_{y=0}^{10}(40-r)_{C_5} =$ (2015)
1) $41_{C_5} - 30_{C_5}$ 2) $41_{C_6} - 30_{C_6}$ 3) $41_{C_5} + 30_{C_5}$ 4) 41_{C_6}

128. The number of four digit numbers formed by using the digits 0, 2, 4, 5 & which are not divisible by 5 is (2015 A.P)
1) 10 2) 8 3) 6 4) 4

129. T_m denotes the number of triangles that can be formed with the vertices of a regular polygon of m sides. If $T_{m-1} - T_m = 15$, then m = (2015 A.P)
1) 3 2) 6 3) 9 4) 12

130. The number of 4 letters words that can be formed with the letters in the word EQUATION with at least one letter repeated is (2016)
1) 2400 2) 2408 3) 2416 4) 2432

131. The number of divisors of 7! is (2016)
1) 24 2) 72 3) 64 4) 60

132. The sum of all 4 – digit numbers that can be formed using the digits 2, 3, 4, 5, 6 without repetition, is (2016AP)
1) 533820 2) 532280 3) 533280 4) 532380

133. If a set A has 5 elements, then the number of ways of selecting two subsets P & Q from A such that P & Q are mutually disjoint, is (2016AP)
1) 64 2) 128 3) 243 4) 729

134. A village has 10 players. A team of 6 players is to be formed, 5 members are chosen first out of this 10 players & then captain is choosen from the remaining players. Then the total number of ways of choosing such teams is (2017)
1) 1260 2) 210 3) $(10C_6)5!$ 4) $(10C_5)6$

135. Using the letters of the word TRICK, a letter word with distinct letters is formed such that C is in the middle. Then how many ways this is possible? (2017)
1) 6 2) 120 3) 24 4) 72

136. The number of different signals which can be given from 7 different coloured sheets, taking one or more at a time is (2017AP)
1) 127 2) 5913 3) 13699 4) 13700

137. If the number of subsets with 8 elements from the set A = {a_1, a_2, a_3, ……. A_n} $n \geq 8$, is five times the number of such subsets containing a_4, then n =
(2017AP)
1) 35 2) 40 3) 45 4) 0

138. $^{29}C_5 + \sum_{r=0}^{4} {}^{(33-r)}C_4 =$
(2017AP)
1) $^{32}C_4$ 2) $^{35}C_5$ 3) $^{34}C_4$ 4) $^{34}C_5$

KEY

1) 4	2) 3	3) 4	4) 3	5) 3	6) 3	7) 4	8) 2	9) 3	10) 4
11) 4	12) 3	13) 1	14) 1	15) 4	16) 4	17) 3	18) 4	19) 1	20) 2
21) 2	22) 1	23) 1	24) 3	25) 4	26) 1	27) 1	28) 1	29) 2	30) 4
31) 3	32) 3	33) 1	34) 1	35) 2	36) 2	37) 1	38) 1	39) 4	40) 3
41) 1	42) 1	43) 2	44) 1	45) 4	46) 3	47) 2	48) 2	49) 4	50) 3
51) 1	52) 3	53) 4	54) 1	55) 1	56) 3	57) 3	58) 2	59) 3	60) 2
61) 2	62) 2	63) 4	64) 2	65) 1	66) 1	67) 1	68) 2	69) 1	70) 1
71) 1	72) 1	73) 1	74) 4	75) 1	76) 3	77) 2	78) 1	79) 2	80) 3
81) 4	82) 1	83) 4	84) 4	85) 2	86) 3	87) 1	88) 1	89) 4	90) 3
91) 3	92) 2	93) 2	94) 4	95) 4	96) 1	97) 4	98) 1	99) 2	100) 4
101) 3	102) 1	103) 2	104) 1	105) 4	106) 1	107) 1	108) 4	109) 1	110) 1
111) 3	112) 2	113) 3	114) 4	115) 3	116) 4	117) 2	118) 2	119) 4	120) 3
121) 2	122) 3	123) 3	124) 4	125) 3	126) 2	127) 2	128) 2	129) 2	130)3
131) 4	132) 3	133) 3	134) 1	135) 3	136) 3	137) 2	138) 4	139)	

Exercise-B

1. The number of ways in which a man can invite one or more of his 8 friends to dinner is
1)28 2)128 3)240 4)255

2. The number of ways in which a team of eleven players can be selected from 22 players always including 2 of them and excluding 4 of them is
1)$^{16}C_{11}$ 2)$^{16}C_5$ 3)$^{16}C_9$ 4)$^{20}C_9$

3. The number of positive divisors of $2^5 3^6 7^3$ is
1)14 2)167 3)168 4)166

4. A committee of 5 is to be formed from 6 boys and 5 girls. The number of ways that the committee can be formed so that the committee contains at least one boy and one girl is
1)248 2)455 3)720 4)1025

5. In how many ways can 5 red and 4 white balls be drawn from a bag containing 10 red and 8 white balls?
1)$^8C_5 X^{10}C_4$ 2)$^{10}C_5 X^8C_4$ 3)$^{18}C_9$ 4)none

6. How many different committees of 5 can be formed from 6 men and 4 women on which exactly 3 men and 2 women serve?
1)6 2)20 3)60 4)120

7. The number of ways of selections one or more out of 7 given things is
1)64 2)63 3)128 4)127

8. The number of lines that can be formed from 12 points in a plane of which no three of them are collinear except 6 points lie on a line is
1)45 2)52 3)50 4)46

9. If a polygon has 35 diagonals, then the number of sides of the polygon is
1)25 2)20 3)15 4)10

10. If ${}^{(2n+1)}P_{n-1}$: ${}^{(2n-1)}P_n$=3:5 then n=
1)4 2)5 3)6 4)3

11. A group contains 6 men and 3 women. A committee is to be formed with 5 people containing 3 men and 2 women. The number of different committees that can be formed is
1)${}^{9}C_5$ 2)${}^{6}C_3 X {}^{3}C_2$ 3)${}^{6}C_3$ 4)${}^{3}C_2$

12. If ${}^{n}P_7$ =42 ${}^{n}P_5$, then n=_____
1)5 2)-1 3)7 4)12

13. The number of quadratic expressions with the coefficients drawn from the set {0,1,2,3 }is
1)27 2)36 3)48 4)64

14. The number of ways in which 13 gold coins can be distributed among three persons such that each one gets at least two gold coins is
1)36 2)24 3)12 4)6

15. If C(2n,3):C(n,2)=12:1, then n=
1)4 2)5 3)6 4)860.

16. The number of ways in which 5 boys and 4 girls sit around a circular table so that no two girls sit together is
1)5!4! 2)20! 3)12! 4)15!

17. Using the digits 0,2,4,6,8 not more than once in any number, the number of 5 digited numbers that can be formed is
1)16 2)24 3)120 4)96

KEY

1) 4	2) 3	3) 3	4) 2	5) 2	6) 4	7) 4	8) 2	9) 4	10) 4
11) 2	12) 2	13) 3	14) 1	15) 2	16) 1	17) 4			

AIEEE PROBLEMS

1. The number of ways in which 6 men and 5 women can dine at a round table if no two women are sit together is given by[2003]
   1) 30 2) $5!\times 4!$ 3) $7!\times 5!$ 4) $6!\times 5!$

2. How many ways are there to arrange the letters in the word GARDEN with the vowels in alphabetical order? [2004]
   1) 120 2) 480 3) 360 4) 540

3. If the letters of word SACHIN are arranged in all possible ways and these words are written out as in dictionary then the word SACHIN appears at serial number [2005]
   1) 601 2) 600 3) 603 4) 602

4. ${}^{n}C_{r+1} + 2^{n}C_{r} + {}^{n}C_{r-1} =$ [2003]
   1) ${}^{(n+1)}C_{r+2}$ 2) ${}^{(n+1)}C_{r+1}$ 3) ${}^{(n+2)}C_{r+1}$ 4) ${}^{(n+2)}C_{(r+2)}$

5. A student is to answer 10 out of 13 questions in an examination such that he must choose atleast 4 from the first five questions. The number of choices available to him is [2003]
   1) 196 2) 280 3) 346 4) 140

6. The number of ways of distrusting 8 identical balls in 3 distinct boxes so that none of the boxes is empty is [2004]
   1) 5 2) ${}^{8}C_{3}$ 3) 3^{8} 4) 21

7. The value of ${}^{50}C_{4} + \sum_{r=1}^{6} {}^{56-r}C_{3}$ is [2005]
   1) ${}^{55}C_{4}$ 2) ${}^{55}C_{3}$ 3) ${}^{56}C_{3}$ 4) ${}^{56}C_{4}$

8. At an election, a voter may vote for any number of candidates, not greater than the number to be elected. There are 10 candidates and 4 are to be selected. If a voter votes for at least one candidate, then the number of ways in which he can vote is [2006]
   1) 385 2) 1110 3) 5040 4) 6210

KEY

1) 4	2) 1	3) 1	4) 3	5) 1	6) 4	7) 1	8) 1

6. BINOMIAL THEOREM

1. If 'n' is a positive integer then $(x+a)^n = {}^nc_o\, x^n + {}^nc_1\, x^{n-1}.a + {}^nc_2\, x^{n-2}.a^2 + \ldots + {}^nc_r x^{n-r} a^r + \ldots + {}^nc_n a^n$
2. General term $T_{r+1} = {}^nc_r\, x^{n-r}\, a_r$
3. In an expansion of $(ax^p + \frac{b}{x^q})^n$, the coefficient of x^m is ${}^nc_r\, a^{n-r}.b^r$ where

   $r = \frac{np - m}{p + q}$
4. The term independent of 'x' in the expansion of $(ax^p + \frac{b}{x^q})^n$ is T_{r+1} where

   $r = \frac{np}{p + q}$
5. Number of terms in the expansion of $(a+b)^n = n+1$
6. Number of terms in the expansion of $(a+b+c)^n$ is $(n+1)(n+2)/3!$
7. Number of terms in the expansion of $(a_1+a_2+\ldots + a_r)^n$ is $(n+r-1)!/n!(r-1)! = {}^{(n+r-1)}c_{(r+1)}$
8. If 'n' is even, then there is only one middle term in the expansion of $(x+a)^n$ is $(n/2+1)^{th}$ term.
9. If 'n' is odd then there are two middle terms in the expansion of $(x+a)^n$ i.e $(n+1)/2$ th and $(n+3)/2$th terms.
10. Numerically greatest term in $(1+x)^n$

    a)If $\frac{(n+1)|x|}{|x|+1} = P$ where 'p' is integer

    then pth and (P+1)th terms are numerically greatest terms

    b) If $\frac{(n+1)|x|}{|x|+1} = P+f$ where p is integer and $0<f<1$ then (P+1)th term is numerically greatest term
11. If the coefficients of pth and q^{th} terms in the expansion of $(1+x)^n$ are equal then $p+q = n + 2$
12. If the coefficients of x^r, x^{r+1} in the expansion of $(a+x/b)^n$ are equal then $n=(r+1)(ab+1) -1$
13. $C_o + C_1 + C_2 + \ldots + C_n = 2^n$
14. $C_0 - C_1 + C_2 - C_3 + \ldots + (-1)^n c_n = 0$
15. $C_0 + C_2 + C_4 + C_6 + \ldots = 2^{n-1}$
16. $C_1 + C_3 + C_5 + \ldots = 2^{n-1}$
17. $1C_1 + 2C_2 + 3C_3 + \ldots + n.C_n = n2^{n-1}$

18. $1C_1-2C_2+3C_3+\ldots+(-1)^{n-1}nc_n=0$

19. $C_1+2xc_2+3x^2c_3+\ldots+nx^{n-1}\,.\,c_n=n(1+x)^{n-1}$

20. $a\,c_0+(a+d)\,C_1+(a+2d)c_2+\ldots+(a+nd)\,c_n=(2a+nd)\,2^{n-1}$

21. $ac_o-(a+d)c_1+(a+2d)\,C_2-\ldots+(-1)^n(a+nd)\,c_n=0$

22. $\frac{C_1}{c_o}+\frac{2\,c_2}{C1}+\frac{3\,c_3}{c_2}+\ldots\,nC_n/c_{n-1}=n(n+1)/2$

23. $ac_0^2+(a+d)c_1^2+(a+2d)\,c_2^2+\ldots+(a+nd)\,C_n^2=1/2\,(2a+nd)\,.\,{}^{2n}c_n$

24. $C_0+(C_0-C_1)+(C_o+C_1+C_2)+\ldots+(C_o+C_1+C_2+\ldots+C_{n-1})=n.2^{n-1}$

25. $(C_o+C_1)\,(C_1+C_2)\ldots(C_{n-1}+C_n)=C_0C_1C_2\ldots C_n(n+1)^n/n!$

26. $C_oC_r+C_1C_{r+1}+C_2\,C_{r+2}+\ldots+Cn\text{-}r\,Cn={}^{2n}c_{n-r}$ or ${}^{2n}c_{n+r}$

a) $C_o^2+C_1^2+C_2^2+\ldots+C_n^2={}^{2n}c_n$

b) $C_0C_1+C_1C_6+C_2C_7+\ldots+C_{n-5}\,C_n={}^{2n}c_{n-5}$

c) $C_0C_5+C_1C_6+C_2C_7+\ldots+C_{n-5}\;C_n={}^{2n}c_{n-5}$

27. $xc_o+x^2c_1/2+x^3C_2/3+\ldots+x^{n+1}\;/\,n+1\;\;c_n=((1+x)^{n+1}-1)/(n+1)$

28. $C_0^2-C_1^2+c_2^2-C_3^2+..+(-1)^n\,Cn^2=0$

29. ${}^nc_n+{}^{(n+1)}c_n+{}^{(n+2)}c_n+\ldots+{}^{(n+m)}c_n={}^{(n+m+1)}c_{(n+1)}$

30. $(1-x)^{-1}=1+x+x^2+x^3+x^4+\ldots\ldots\ldots$

31. $(1+x)^{-1}=1-x+x^2-x^3+x^4-x^5+\ldots\ldots..$

32. $(1-x)^{-2}=\sum_{r=0}^{\infty}(-1)^r\,(r+1)\,x^r$

33. $(1-x)^{-3}=\sum_{r=0}^{\infty}\frac{(r+1)\,(r+2)}{2}\,x^r$

34. $(1-x)^{-3}=\sum_{r=0}^{\infty}\frac{(r+1)\;(r+2)}{2}\,x^r$

35. $(1-x)=\sum_{r=0}^{\infty}\frac{(-1)r\;(r+1)(r+2)}{2}\,x^r$

36. If 'n' is a positive integer and $|x|<1$ then

$(1-x)\text{-}n=\sum_{r=0}^{\infty}(n+r-1)\,c_r\;x^r$

37. $(1-x)^{-p/q}=1+P(x/q)+P(p+q)/1.2\;\;(x/q)^2+p(P+2q)\,(p+3q)/1.2.3\;\;(x/q)^3+\ldots..$

38. $(1+x)^{-P/q} = 1-P(x/q) + p(p+q)/1.2 \quad (x/q)^2 + p(p+q)(p+3q) \quad (x/q)^3 + \ldots$

39. The coefficient of x^n in the expansion of $x/(x-a)(x-b)$ in ascending powers of x is

$(1/(a-b))(a^n-b^n)/a^n.b^n$

40. If 'n' is a positive integer then

a) $(P+1)^n - pn-1$ is divisible by p^2

b) $(P-1)^{2n} + 2pn-1$ is divisible by p^2

Exercise-A

1. The 4th term of $\left(x+\frac{2}{x^3}\right)^6$ is

1) ${}^6C_3(x)^3\left(\frac{2}{x^2}\right)^2$ 2) ${}^6C_3(x)^3\left(\frac{2}{x^3}\right)^2$

3) ${}^6C_3(x)^2\left(\frac{2}{x^2}\right)^2$ 4) ${}^6C_3(x)^2\left(\frac{2}{x^2}\right)^3$

2. The 3rd term $\left(3x-\frac{y^3}{6}\right)^4$ is

1) ${}^4C_2(3x)^2\left(-\frac{y^3}{6}\right)^2$ 2) ${}^4C_2(3x)^2\left(-\frac{y^2}{6}\right)^2$

3) ${}^4C_2(3x)^3\left(-\frac{y^3}{6}\right)^2$ 4) ${}^4C_2(3x)^3\left(-\frac{y^3}{6}\right)^2$

NOTE: $\frac{C_1}{C_0}+2\frac{C_2}{C_1}+3\frac{C_3}{C_2}+-------+n\frac{C_n}{C_{n-1}}=\frac{n(n+1)}{2}$

3. $\frac{10C_1}{10C_0}+2\frac{10C_2}{10C_1}+3\frac{10C_3}{10C_2}+-------+10\frac{C_n}{C_{n-1}}=\frac{10C_{10}}{10C_9}=--$

1)45 2)55 3)35 4)65

NOTE: $C_0^2 - C_1^2 + C_2^2 - C_3^2 + \text{-------} + (-1)^n C_n^2 = 0$ if n is odd.

$= (-1)^{\frac{n}{2}} {}^nC_{\frac{n}{2}}$ if n is even

4. $(15C_0)^2 - (15C_1)^2 + (15C_2)^2 - (15C_3)^2 + \text{-------} + (15C_{15})^2 =$

1)0 2)1 3)-1 4)2

5. $(10C_0)^2 - (10C_1)^2 + (10C_2)^2 - (10C_3)^2 + \text{-------} + (10C_{10})^2 =$

1) $10C_5$ 2) $-10C_{15}$ 3) $-10C_5$ 4) $10C_{15}$

NOTE : ${}^{n}C_{n} + {}^{n+1}C_{n} + {}^{n+2}C_{n} + \ldots + {}^{n+m}C_{n} = {}^{n+m+1}C_{n+1}$

6. ${}^{6}C_{6} + {}^{7}C_{6} + {}^{8}C_{6} + \ldots + {}^{15}C_{6} =$
1) ${}^{16}C_{7}$ 2) ${}^{8}C_{7}$ 3) 1) ${}^{12}C_{7}$ 4) 1) ${}^{4}C_{7}$

NOTE: The greatest binomial coefficient of ${}^{n}C_{0}$, ${}^{n}C_{1}$ is

i. ${}^{n}C_{\frac{n}{2}}$ if n is even.

ii. $\frac{{}^{n}C_{n-1}}{2}$ or $\frac{{}^{n}C_{n+1}}{2}$ if n is odd.

7. The greatest binomial coefficient of ${}^{10}C_{0}$, ${}^{10}C_{1}$--------- ${}^{10}C_{10}$ is
1) $10\ C_{5}$ 2) $-10\ C_{15}$ 3) $-10\ C_{5}$ 4) $10\ C_{15}$

8. The greatest binomial coefficient of ${}^{15}C_{0}$, ${}^{15}C_{1}$--------- ${}^{15}C_{15}$ is
1) ${}^{15}C_{5}$ or ${}^{15}C_{7}$ 2) ${}^{15}C7$ or ${}^{15}C_{8}$ 3) ${}^{15}C_{7}$ or ${}^{15}C_{8}$ 4) ${}^{15}C_{8}$ or ${}^{15}C_{7}$

9. In the expansion $(1+x)^{n}$, the coefficient 5th , 6th and 7th terms are in A.P. then n=
1)7 2) 9 3) 14 4) 5

10. Sum of the coefficient of the even powers of 'x' in the expansion $(1+x+x^{2}+x^{3})^{5}$ is
1) 510 2) 225 3) 4^{5} 4) 512

11. In the expansion of $(1+x)^{n}$, if the coefficient of pth term is equal to 'p' and the coefficient of (P+1)th term is q then n=
1)P+q 2) P+q-2 3) P+q+1 4) P+q-1

12. The number of terms in $(a+b+c)^{11}$ are
1)66 2) 12 3) 78 4) 55

13. $C_{o} - C_{1}/2 + C_{2}/3 \ldots\ldots\ldots + (-1)^{n}.C_{n}/n+1=$
1)n /n+1 2) 1/n+1 3) n-1/n+1 4) $(-1)^{n}$ (1/n+1)

14. The sum of the coefficients in the expansion of $(1+x-3x^{2})^{17}$ is
1)0 2) 1 3) -1 4) 2

15. The coefficient of x^{-n} in $(1+x)^{n}(1+1/x)^{n}$ is
1)0 2) 1 3) 2^{n} 40 ${}^{2n}c_{n}$

16 If the coefficient of rth term and $(r+1)^{th}$ term in the expansion of $(1+x)^{20}$ are in the ratio 1:2 then r=
1)6 2) 7 3) 8 4) 9

17. The term independent of 'x' in the expansion of $(x^2-1/x)^6$ is
1)-12 2) 15 3) 24 4) -15

18. The coefficient of the 8th term in the expansion of $(1+x)^{10}$ is
1)120 2) 7 3) $10c_3$ 4) 210

20. $1+1.3 / 2.5 + 1.3.9 / 2.4.25 + 1.3.5.27 / 2.4.46.125+\ldots \infty$
1) $\sqrt{5}/2$ 2) $\sqrt{2}/5$ 3) $\sqrt{3}/5$ 4) $\sqrt{5}/3$

21. The coefficient of x^5 in the expansion of $(1+x^2)^5 (1+x)^4$
1)20 2) 30 3) 60 4) 55

22. The coefficient of x^3 in $(\sqrt{x^5} + 3/\sqrt{x^3})^6$ is
1)0 2) 120 3) 420 4)540

23. If the coefficient of x^7 and x^8 in $(2+x/3)^n$ are equal then n =
1) 50 2) 45 3) 55 4) 60

24. The total number of term in the expansion of $(a+x)^{100} + (a-x)^{100}$ is
1)202 2) 51 3) 100 4) 5

25. If the 4th term of $[1/x+px]^6$ is 5/2 then p is
1)2/3 2)1/2 3)4/3 4)4

26. The coefficient of x^{24} in $(1+3x+6x^2+10x^3+----\infty)^{2/3}$ is
1)24 2)25 3) 30 4) 26

27. The coefficient of x^6 in the expansion of $\frac{1+2n}{1-n}$
1)1 2) 2 3)3 4)4

28 The value of $(1+\sqrt{2})^4 + (1-\sqrt{2})^4$ is
1)33 2)34 3)35 4)36

29. The GBC of $10C_0$ $10C_1$ $10C_2$ ….$10\ C_{10}$ is
1) $10C_1$ 2) $10C_2$ 3)$10C_3$ 4)-1

30. The number of term in the expansion of $(x+y+z)^{10}$ is
1)$12C_2$ 2)$10C_1$ 3) $10C_2$ 4)$12C_3$

31. If the sum of the coefficient in $(x+y+z)^n$ is 3^8 then the no. of terms
1)35 2)25 3)65 4)45

32. If $(1-x+x^2)^n = a_0+a_1x+a_2x^2+ \ldots a_{2n}x^{2n}$ then $a_0-a_1+a_2- \ldots +a_{2n}$=___
1)0 2)2^n 3)3^n 4)4^n

33. In the expansion of $(1+x)^{50}$ then the sum of the coefficient of odd power of n is
1)2^{48} 2)2^{25} 3)2^{49} 4)All three

34. If n is a positive Integer then $\sum_{r=0}^{\infty} (nC_r)^2 =$—
1)$2n!/(n!)^2$ 2)nC_r 3)$2n!/(n!)$ 4)$[n^2(n+1)^2]/4$

35. The coefficient of x^5 in $(1+2x+3x^2+\ldots\ldots)^{-3/2}$ is
1)0 2)5 3)(n+1) 4)3

36. If $C_0, C_2, C_4 \ldots$ Bionomial coefficient in the expansion of $(1+x)^9$ then
$C_0+C_2+C_4+C_6+C_8 =$___
1)2^5 2)2^6 3)2^8 4)2^9

37.. If $y=\frac{1}{3}+\frac{1.3}{3.6}+\frac{1.3.5}{3.6.9}+\ldots$ then $y^2+2y-2=$___
1)4 2)3 3)0 4)-1

38. $\sum_{k=0}^{5} 5C_k =$ ____
1)2 2)4 3)16 4)2^5

39. Find the sum of the series of
$1+\frac{k}{3}+\frac{k(k+1)}{3.6}+\frac{k(k+1)(k+2)}{3.6.9}+\ldots..$
1)$(3/2)^k$ 2)$(2/3)^k$ 3)$(1/4)^k$ 4)$(5/6)^k$

40. If the coefficient of x in the expansion of $(x^2+c/x)^5$ is 2>0 then c=__
1)4 2)14 3)13 4)3

41. The third term in the expansion of $(1+2x)^n = 1+8x+$
1)$12x^2$ 2)24x 3)$24x^2$ 4)48x

42. If the 21st and 22nd term in the expansion of $(1+x)^{44}$ are equal find the value of x.
1)8/7 2)7/8 3)1/8 4)2/9

43. The term I.D of x in the expansion of $(x^2-1/x)^6$ is
1)20 2)30 3)40 4)50

44. If the coefficient of rth term and (r+1)th term in the expansion of $(1+x)^{20}$ are in the ratio 1:2 then r=__
1)6 2)7 3)8 4)9

45. The number of non-zero term in the expansion of $(1+3\sqrt{2}x)^9+(1-3\sqrt{2}x)^9$ is
1)2 2)3 3)4 4)5

46. If the rth term in the expansion of $(x/2+3/x^2)^{10}$ contain x^4 then r=__
1)2 2)3 3)4 4)5

47. If the coefficient of pth term of $(1+x)^n$ is p and that of (p+1)th term is q then n=__
1)p+q-2 2)p+q-4 3)p+q-1 4)p

48. If C_n is the coefficient of x^n in the expansion of $(1+x)^n$ then $C_1+2C_2+3C_3+\ldots+nC_n$=___
1)$n.2^{n-1}$ 2)2^{n-1} 3)$(n+1)2^n$ 4)2

49. If p and q are the coefficient of x^n in $(1+x)^{2n}$ and $(1+x)^{2n-1}$ respectively then p:q=__
1)2:3 2)2:41 3)2:1 4)1:1

50. Sum of the infinite series.
$1-\frac{1}{8}+\frac{1.3}{8.16}+\ldots$=_____
1)√5 2)2/√5 3)1/√5 4) √5/3

51. If the coefficient of 2nd, 3rd and 4th term of the expansion of $(1+x)^{2n}$ in AP then $2n^2-9n+7$=____
1)5 2)1 3)4 4)0

52. The coefficient of x^r in $(1+x)^n$ is
1)nC_{r+1} 2)nC_r 3)$n+1\ C_r$ 4)n

53. If $y= x-x^2+x^3+\ldots$ then x=___
1)y/(1+y) 2)-y/(1+y) 3)y/(1-y) 4)xy

54. The formula to find NGT in $(1+x)^n$
1)$\frac{|n+1|}{|n|}$ 2)$\frac{|n+1|}{|n|+1}$ 3)$\frac{(n+1)|x|}{(x)+1}$ 4)n+1

55. The sum of the coefficient of $(2x+3y)^7$ is
1)5^7 2)3^7 3)4^7 4)6^7

56. The sum of the coefficient in $(1+2x-3x^2)^{100}$
1)5 2)0 3)15 4)20

57. The number of term in the expansion of $(x+100)^{100}+(x-100)^{100}$
1)51 2)50 3)25 4)75

58. In the expansion of $(1+x)^n$ sum of even coefficient=__
1)2^n 2)2^{n+1} 3)2^{n-1} 4)2

59. If $C_0\ C_1\ C_2\ldots\ C_n$ are Bionomial coefficient in $(1+x)^n$ then

$C_0^2+C_1^2+C_2^2+\ldots+C_n^2=$___

1)$\frac{2n!}{(n!)^2}$ 2)$\frac{2___}{(n!)^2}$ 3)2n 4)0

60. If $C_0\ C_1\ldots C_n$ are the Binomial coefficient of $(1+x)^n$ then $C_0C_1+C_1C_2+\ldots+C_{n-1}Cn$

1)nCn-1 2)$2nC_{n-1}$ 3)nC_{n+1} 4)2^n

61. $1+x+x^2+x^3+\ldots=$____

1)$(1-x)^{-2}$ 2)$(1-x)^{-1}$ 3)$(1+x)^{-1}$ 4)$(x+1)^{-2}$

62.. The expansion of $(1+x^2)^5\ (1+x)^4$ contain x^5 then the coefficient of x^5 is

1)25 2)60 3)90 4)75

63 If $(1+x+x^2)n=\sum_{r=0}^{2n} a^r x^r$ then $a_1-2a_2+3a_3+\ldots-2na_{2n}=$___

1)-n 2n 3)n+1 4)n-1

64. The coefficient of x^3 in $(\sqrt{x^5}+3/\sqrt{x^3})^6$ is

1)0 2)120 3)420 4)540

65. Match the following.

Expansion	Number of terms
I. $(x+7y)^{12}$	a)56
II.$((2a+3b+c)^5$	b)20
III. $(a+b+c+d)^3$	c)21
IV. $(a+b+c+d)^5$	d)13

1)a,b,c,d 2)d,c,b,a 3)a,c,d,b 4)d,a,b,c

66. A: If the coefficients of 5th,6th,7th terms of $(1+x)^n$ are in A.P. then n=7 or 14.
R: If the coefficients of rth,(r+1)th, (r+2)th terms of $(1+x)^n$ are in A.P. then $n^2-(4r+1)n+4r^2=2$.

1) Both A and R are true and R is the correct explanation of A
2) Both A and R are true but R is not correct explanation of A
3) A is true but R is false 4) A is false but R is true

PREVIOUS EAMCET PAPERS PROBLEMS

67. The number of nonzero terms in the expansion of $(1+3\sqrt{2}x)^9+(1-3\sqrt{2}x)^9$ is (1991)

1)9 2)0 3)5 4)10

68. $C_0+\frac{C_1x}{2}+\frac{C_2x^2}{3}+\ldots+\frac{C_nx^n}{n+1}=$ (1991)

1)$1/(n+1)x$ 2)$(1+x)^n/(n+1)x$
3)$(1+x)^{(n+1)}/(n+1)$ 4)$[(1+x)^{n+1}-1]/[(n+1)x]$

69. Independent term of $(\sqrt{x}-2/x)^{18}$ is (1991)
1) ${}^{18}C_6 2^6$ 2) ${}^{18}C_5 2^5$ 3) ${}^{16}C_6 2^6$ 4) ${}^{16}C_5 2^5$

70. . $C_0 - \frac{C_1}{2} + \frac{C_2}{3} - \ldots + (-1)^n \frac{C_n}{n+1} =$ (1994)
1) $\frac{2^{n+1}-1}{n+1}$ 2) $\frac{2^n-1}{n+1}$ 3) $\frac{2^n}{n+1}$ 4) $\frac{1}{n+1}$

71. $C_o - C_2 + C_4 - C_6 + \ldots$ (1994)
1) 2^{n-1} 2) $2^{n/2} \sin(n\pi/4)$ 3) $2^{n/2}\cos(n\pi/4)$ 4) 0

72. . If $(1+2x+x^2)^n = \sum_{r=0}^{2n} a_r x^r$ then $a_r =$ (1994)
1) $({}^nC_r)^2$ 2) ${}^nC_r \, {}^nC_{r-1}$ 3) ${}^{2n}C_r$ 4) ${}^{2n}C_{r+1}$

73. The coefficient of x^3 in $\left(\sqrt{x^5} + \frac{3}{\sqrt{x^3}}\right)^6$ is (1994)
1) 0 2) 120 3) 420 4) 540

74. The term independent of x in $\left(ax + \frac{b}{x}\right)^{14}$ is (1995)
1) $14!a^7b^7$ 2) $14!a^7b^7/(7!)^2$ 3) $14!a^7b^7/7!$ 4) $14!a^7b^7/(17)^3$

75. If the coefficients of 5th, 6th, 7th terms of $(1+x)^n$ are in A.P. then n= (1995)
1) 10 2) 12 3) 14 4) 15

76. $C_1 + 4.C_2 + 7.C_3 + \ldots + (3n-2).C_n =$ (1995)
1) $(3n-4)2^{n+1}$ 2) $(3n-4)2^{n-1}+2$ 3) $(3n-4)2^n$ 4) $(3n-4)2^{n-1}+1$

77. The term independent of x in $\left(\sqrt{x} - \frac{2}{x^2}\right)^{10}$ is
1) 9/64 2) 8/45 3) 64/45 4) 45/64 (1996)

78. If $C_0, C_2, C_4, ..$ are the binomial coefficients in the expansion of $(1+x)^9$ then $C_0+C_2+C_4+C_6+C_8=$ (1996)
1) 2^7 2) 256 3) 2^9 4) 258

79. If a_r is the coefficient of x^r in the expansion of $(1-2x+3x^2)^n$ then $\sum_{r=0}^{2n} r.a_r =$ (1996)
1) $n.2^n$ 2) $n.2^{n+1}$ 3) $(n+1).2^n$ 4) $(n+1).2^{n+1}$

80. The coefficient of x^5 in $(1+x^2)^5(1+x^4)$ is (1996)
1) 120 2) 30 3) 60 4) 55

81. If T_r denotes the rth term in the expansion of $(x+1/y)^{23}$ then (1996)
1)$T_{12} = T_{13}$ 2)$x^2T_{13}=T_{12}$ 3)$T_{12}= xyT_{13}$ 4)$T_{12}+T_{13}=2572$.

82. If $(1+x+x^2)^n=\sum_{r=0} a_r x^r$ then $a_1-2a_2+3a_3-\ldots..-2na_{2n} =$ (1997)

1)0 2)1 3)n 4)-n

83. The numerically greatest term in the expansion of $(3+2x)^{49}$ when x=1/5 is
1)4th term 2)5th term 3)6th term 4)7th term (1997)

84. The term independent of x in the expansion of $\left(2x^2-\frac{3}{x^3}\right)^{15}$ is (1998)

1)$^{15}C_9 2^8 3^7$ 2) $-^{15}C_9 2^{10} 3^5$ 3)$^{15}C_9 2^{15}$ 4)$^{15}C_9 2^9 3^6$

85. $C_1+2.C_2+3.C_3+\ldots+nC_n=$ (1998)
1)$n.2^n$ 2)$n.2^{n-1}$ 3)$(n+1)2^n$ 4)$(n-1)2^n$

86. The term independent of x in the expansion of $\left(x^2-\frac{1}{x}\right)^6$ is

1)12 2)15 3)24 4)-15 (1999)

87. The coefficient of the 8th term in the expansion of $(1+x)^{10}$ is (1999)
1)120 2)7 3)$^{10}C_8$ 4)210

88. The sum of the coefficients in the expansion of $(1+x-3x^2)^{171}$ is (2000)
1)0 2)1 3)-1 4)2

89. The coefficient of x^{-n} in $(1+x)^n\left(1+\frac{1}{x}\right)^n$ is (2000)

1)0 2)1 3)2^n 4)$^{2n}C_n$

90. If the coefficients of rth term and (r+1)th term in the expansion of $(1+x)^{20}$ are in the ratio1:2, then r= (2000)
1)6 2)7 3)8 4)9

91. If $(1+x)^n =C_0+C_1x+C_2x^2+\ldots C_n x^n$, then $C_0+2.C_1+3.C_2+\ldots+(n+1).C_n=$ (2001)
1)2^n+n2^{n-1} 2)$2^{n-1}+n2^n$ 3)$2^n+(n+1)2^n$ 4)$2^{n-1}+(n-1)2^n$

92. The coefficient pf x^4 in the expansion of $\frac{(1-3x)^2}{(1-2x)}$ is (2001)

1)1 2)2 3)3 4)4

93. $1 + \frac{1}{4}+\frac{1.3}{4.8} + \frac{1.3.5}{4.8.12} =$ (2001)

1)$\sqrt{2}$ 2)$1/\sqrt{2}$ 3)$\sqrt{3}$ 4)$1/\sqrt{3}$.

94 $(1+x)^{15}=a_0+a_1x+\ldots\ldots+a_{15}x^{15} \Rightarrow \sum \sum_{r=1}^{15}\frac{ra_r}{a_{r-1}} =$ (2005)

1)110 2)115 3)120 4)135

95. If C_k is the coefficient of x^4 in the expansion of $(1+x)^{2005}$ and a, d are real numbers then $\sum_{k=0}^{2005}(a+kd)c_k =$ (2005)

1)$(2a+2005\ d)2^{2004}$ 2)$(2a+2005\ d)2^{2005}$
3)$(2a+2004\ d)2^{2005}$ 4)$(2a+2004\ )2^{2005}$

96. If $|x| < ½$, then the number of x^r in the expansion of $\frac{1+2x}{(1-2x)^2}$ is : (2005)

1)$r.2^r$ 2)$(2r-1)2^r$ 3)$r.2^{2r+1}$ 4)$(2r+1)\ 2^r$

97. $1+\frac{2}{4}+\frac{2.5}{4.8}+\frac{2.5.8}{4.8.12}+\frac{2.5.8.11}{4.8.12.16}+\ldots\ldots\ldots$ (2006)

1)$4^{-2/3}$ 2)$\sqrt[3]{16}$ 3)$\sqrt[3]{4}$ 4)$4^{3/2}$

98 The correct matching of List-I from List –II is : (2006)

List-I	List-II
A)$(1-x)^{-n}$	i)$\frac{x}{x+1}$
B)$(1+x)^{-n}$	ii)$1-nx+\frac{n(n+1)x^2}{2!}-\ldots\ldots$ if $\lvert x\rvert < 1$
C)If x>1, then $1+1/x+1/x^2+\ldots$ is	iii)$1+nx+\frac{n(n+1)x^2}{2!}+\ldots\ldots$ if $\lvert x\rvert < 1$
D)If $\lvert x\rvert>1$, then $1-2/x^2+3/x^4-4/x^6-\ldots$ is	iv)$\frac{x}{x-1}$
	v)$\frac{x^4}{(x^2+1)^2}$
	vi)$\frac{x^4}{(x^2-1)^2}$

	A	B	C	D
1)	I	iii	iv	v
2)	ii	iii	iv	v
3)	iii	ii	iv	v
4)	ii	iii	i	v

98. If a_k is the coefficient of x^k in the expansion of $(1+x+x^2)^n$ for k = 0,1,2,3,…2n then $a_1+2a_2+3a_3+\ldots+2n\,a_{2n} =$ (2007)

1) $-a_0$ 2)3^n 3) $n.\ 3^n$ 4)$n-3^n$

99. The sum of the series $\frac{3}{4.8}-\frac{3.5}{4.8.12}+\frac{3.5.7}{4.8.12.16}-\ldots\ldots$ (2007)

1) $\frac{\sqrt{3}}{2}-\frac{3}{4}$ 2) $\frac{\sqrt{2}}{3}-\frac{3}{4}$ 3) $\frac{\sqrt{3}}{2}-\frac{1}{4}$ 4) $\frac{\sqrt{2}}{3}-\frac{1}{4}$

100. If $(1+x+x^2+x^3)^5=\sum_{k=0}^{15}a_k x^k$ then $\sum_{k=0}^{7}a_{2k}=$ (2008)

1)128 2)256 3)512 4)1024

101. If $\alpha=\frac{5}{2!.3}+\frac{5.7}{3!.3^2}+\frac{5.7.9}{4.3^3}+----$ then $\alpha^2+4\alpha=$ (2008)

1)21 2)23 3)25 4)27

102. The coefficient of x^{24} in the expansion of $(1+x^2)^{12}(1+x^{12})(1+x^{24})$ is: (2009)

1) $12C_6$ 2) $12C_6+2$ 3) $12C_6+4$ 4) $12C_6+6$

103. If x is numerically so small so that x^2 and higher powers of x can be neglected, then $\left(1+\frac{2x}{3}\right)^{\frac{3}{2}}.(32+5x)^{\frac{-1}{5}}$ is approximately equal to: (2009)

1) $\frac{32+31x}{64}$ 2) $\frac{32+32x}{64}$ 3) $\frac{31-32x}{64}$ 4) $\frac{1-2x}{64}$

104. $1+2x+3x^2)^{10}=a_0+a_1x+a_{2x}{}^2+\ldots\ldots\ldots\ldots+a_{20}x^{20}\Rightarrow\frac{a_2}{a_1}=$ (2010)

1) 10.5 2) 21 3) 10 4) 5.5

105. $\frac{3x^2+x+1}{(x-1)^4}=\frac{a}{(x-1)}+\frac{b}{(x-1)^2}+\frac{c}{(x-1)^3}+\frac{d}{(x-1)^4}\Rightarrow\begin{pmatrix}a & b\\ c & d\end{pmatrix}=$ (2010)

1) $\begin{pmatrix}3 & 7\\ 5 & 0\end{pmatrix}$ 2) $\begin{pmatrix}0 & 3\\ 7 & 5\end{pmatrix}$ 3) $\begin{pmatrix}0 & 7\\ 3 & 5\end{pmatrix}$ 4) $\begin{pmatrix}3 & 5\\ 7 & 0\end{pmatrix}$

106. If the coefficients of rth and (r+1)th terms in the expansion of $(3+7x)^{29}$ are equal then r= [2011]

1) 14 2) 15 3) 18 4) 21

107. If $(n-1)_{C_3}+(n-1)_{C_4}>n_{C_3}$ then the minimum value for n is [2011]

1) 5 2) 6 3) 7 4) 8

108. $\sum_{k=t}^{\infty}\sum_{r=0}^{k}\frac{1}{3^k}\left({}^kC_r\right)=$ [2012]

1) $\frac{1}{3}$ 2) $\frac{2}{3}$ 3) 1 4) 2

109. If $ab \neq 0$ and the sum of the coefficients of x^7 and x^4 in the expansion of $\left(\frac{x^2}{a}-\frac{b}{x}\right)^{11}$ is zero, then [2012]

1) a = b 2) a + b = 0 3) ab = - 1 4) ab = 1

110. The term independent of x (x > 0, $x \neq 1$) in the expansion of $\left[\frac{(x+1)}{\left(x^{2/3}-x^{1/3}+1\right)}-\frac{(x-1)}{\left(x-\sqrt{x}\right)}\right]^{10}$ is [2013]

1) 105 2) 210 3) 315 4) 420

111. If x is small so that x^2 & higher powers can be neglected, then the approximate value for $\frac{(1-2x)^{-1}(1-3x)^{-2}}{(1-4x)^{-3}}$ [2013]

1) 1 – 2x 2) 1 – 3x 3) 1 – 4x 4) 1 – 5x

112. If n is an integer with $0 \leq n \leq 11$ then the minimum value of n!(11 – n)! is attained when a value of n = (2014)

1) 5 2) 7 3) 9 4) 11

113. If $(a+bx)^{-1}=\frac{1}{27}+\frac{1}{3}x+.....$ then the ordered pair (a, b) = (2014)

1) (1, 1/3) 2) (3, 9) 3) (3, -9) 4) (3, -27)

114. The term independent of x in the expansion of $\left(\sqrt{x}-\frac{2}{\sqrt{x}}\right)^{18}$ is (2014)

1) $\left(\frac{18}{9}\right)2^{12}$ 2) $\left(\frac{18}{6}\right)2^{6}$ 3) $\left(\frac{18}{6}\right)2^{8}$ 4) $-\left(\frac{18}{9}\right)2^{9}$

115. The number of diagonal of a regular polygon is 35. Then the number of sides of the polgon is (2015)

1) 12 2) 54 3) 27 4) 11

116. $x=1+\frac{3}{11}\times\frac{1}{6}+\frac{3\times7}{2!}\left(\frac{1}{6}\right)^2+\frac{3\times7\times11}{3!}\left(\frac{1}{6}\right)^3+.....\Rightarrow x^4=$ (2015)

1) 81 2) 54 3) 27 4) 8

117. If |x| is so small so that x^2 & higher powers of x may be neglected, then an approximate value of $\frac{\left(1+\frac{2}{3}x\right)^{-3}(1-15x)^{-1/5}}{(2-3x)^4}$ is (2015)

1) $\frac{1}{8}(1+7x)$ 2) $\frac{1}{16}(1-7x)$ 3) $1-7x$ 4) $\frac{1}{16}(1+7x)$

118. If the coefficient of x^9, x^{10}, x^{11} in the expansion of $(1+x)^n$ are in arithmetic progression then $n^2 - 41n =$ (2015 A.P)

1) 398 2) 298 3) -398 4) 198

119. $f(x)=\frac{1}{5}+\frac{1.3}{5.10}+\frac{1.3.5}{5.10.15}+.....\infty$ then $3x^2 + 6x =$ (2015 A.P)

1) 1 2) 2 3) 3 4) 4

120. The sum of the series $1+\frac{2}{3}\left(\frac{1}{8}\right)+\frac{2\times5}{3\times6}\left(\frac{1}{8}\right)^2+\frac{2\times5\times8}{3\times6\times9}\left(\frac{1}{8}\right)^3+.....$ (2016)

1) $\frac{4}{\sqrt[3]{49}}$ 2) $\frac{\sqrt[3]{49}}{4}$ 3) $\frac{4}{\sqrt[3]{81}}$ 4) $\frac{\sqrt[3]{81}}{4}$

121. If C_r denotes the binomial coefficient ${}^nC_r$ then $(-1)C_0^2+2C_1^2+5C_2^2+.....+(3n-1)C_n^2=$ (2016)

1) $(3n-2)^{2n}C_r$ 2) $\left(\frac{3n-2}{2}\right)^{2n}C_n$ 3) $(5+3n)^{2n}C_n$ 4) $\left(\frac{3n-5}{2}\right)^{2n}C_{n+1}$

122. The coefficient of x^4 in the expansion $(1 - x + x^2 - x^3)^4$ is (2016AP)

1) 31 2) 30 3) 25 4) -14

123. If the middle term in the expansion of $(1 + x)^{2n}$ is the greatest term, then x lies in the interval (2016AP)

1) $\left(\frac{n}{n+1},\frac{n+1}{n}\right)$ 2) $\left(\frac{n+1}{n},\frac{n}{n+1}\right)$ 3) (n – 2, n) 4) (n – 1, n)

124. If the coefficient of $(2r + 1)^{th}$ term & $(r +1)^{th}$ term in the expansion of $(1 + x)^{42}$ are equal then r can be (2017)

1) 12 2) 14 3) 16 4) 20

125. In the expansion of $(1 + x)^n$, the coefficient of pth & $(p + 1)^{th}$ terms are respectively p & q, then p + q = (2017)

1) n+ 3 2) n + 2 3) n 4) n + 1

126. The coefficient of x^2 in the expansion of $(1 + x)^2 (8 - x)^{-1/3}$ is (2017AP)

1) $\frac{2167}{4032}$ 2) $\frac{2265}{4132}$ 3) $\frac{313}{576}$ 4) $\frac{3691}{6792}$

127. The sum of the rational terms in the expansion of $\left(\sqrt{2}+\sqrt[5]{3}\right)^{10}$ is (2017AP)

1) 41 2) 42 3) 32 4) 39

KEY

1) 2	2) 1	3) 2	4) 4	5) 1	6) 3	7) 1	8) 3	9) 3	10) 4
11) 4	12) 3	13) 2	14) 3	15) 2	16) 2	17) 1	18) 1	19) 3	20) 4
21) 3	22) 4	23) 3	24) 2	25) 2	26) 2	27) 3	28) 2	29) 4	30) 1
31) 4	32) 3	33) 3	34) 1	35) 1	36) 3	37) 3	38) 4	39) 1	40) 4
41) 3	42) 2	43) 2	44) 2	45) 4	46) 2	47) 3	48) 1	49) 2	50) 2
51) 4	52) 2	53) 3	54) 3	55) 1	56) 2	57) 1	58) 3	59) 1	60) 2
61) 2	62) 2	63) 1	64) 4	65) 2	66) 1	67) 3	68) 4	69) 1	70) 4
71) 3	72) 1	73) 3	74) 4	75) 2	76) 3	77) 2	78) 4	79) 2	80) 2
81) 3	82) 4	83) 3	84) 3	85) 2	86) 2	87) 1	88) 3	89) 1	90) 1
91) 1	92) 4	93) 4	94) 3	95) 1	96) 4	97) 3	98) 3	99) 1	100) 3
101) 3	102) 2	103) 1	104) 1	105) 2	106) 4	107) 4	108) 4	109) 4	110) 2
111) 3	112) 1	113) 3	114) 4	115) 3	116) 3	117) 4	118) 3	119) 2	120) 1
121) 2	122) 1	123) 3	124) 2	125) 4	126) 3	127) 1	128)	129)	130)

AIEEE PROBLEMS

1) The coefficient of x^n in expansion of $(1+x)(1-x)^n$ is [2004]
1) $(n-1)$ 2) $(-1)^{n-1}n$ 3) $(-1)^{n-1}(n-1)^2$ 4) $(-1)^n(1-n)$

2) The number integral terms in the expansion of $(\sqrt{3}+\sqrt[8]{5})^{256}$ is[2003]
1) 33 2) 34 3) 35 4) 32

3) In the binomial expansion of $(a-b)^n$, $n \geq 5$, the sum of 5th and 6th terms in zero, then a/b equals [2007]
1) $\frac{5}{n-4}$ 2) $\frac{6}{n-5}$ 3) $\frac{n-6}{6}$ 4) $\frac{n-4}{5}$

4) If the coefficient of x^7 in $\left[ax^2+\left(\frac{1}{bx}\right)\right]^{11}$ equals the coefficient of x^{-7} in $\left[ax^2-\left(\frac{1}{bx}\right)\right]^{11}$ then a and b satisfy the relation [2005]
1) $a-b=1$ 2) $a+b=1$ 3) $a/b=1$ 4) $ab=1$

5) For natural numbers m, n if $(1-y)^m(1+y)^n = 1+a_1y+a_2y^2+\ldots$ and $a_1=a_2=10$.then (m, n) is [2006]
1) (45, 35) 2) (35, 45) 3) (20, 45) 4) (35, 20)

6) The coefficient of the middle term in the binomial expansion in powers of x of $(1+\alpha x)^4$ and $(1-\alpha x)^6$ is the same if $\alpha =$ [2004]

1) –5/3 2) 3/5 3) –3/10 4) 10/3

7) If $s_n = \sum_{r=0}^{n} \frac{1}{{}^nC_r}$ and $t_n = \sum_{r=0}^{n} \frac{r}{{}^nC_r}$, then $\frac{t_n}{s_n} =$ [2004]

1) $\frac{1}{2}n$ 2) $\frac{2n-1}{2}$ 3) $n-1$ 4) $\frac{1}{2}n-1$

8) If x is positive, the first negative term in the expansion of $(1+x)^{27/5}$ is [2003]

1) 5th term 2) 8th term 3) 6th term 4) 7th term

KEY

1) 4	2) 1	3) 4	4) 4	5) 2	6) 3	7) 1	8) 2

Exercise-B

1. The term independent of x in the expansion of $[2x^{1/2} - 3x^{-1/3}]^{20}$ is
1)8 2)10 3)13 4)14

2. The independent term in the expansion of $[ax+b/x]^{14}$ is
1)$C(14,5)a^9b^5$ 2)$C(14,6)a^8b^8$ 3)$C(14,7)a^7b^7$ 4)$C(14,8)a^6b^8$

3. If T_r denotes the rth term in the expansion of $[x+1/y]^{23}$ then
1)$T_{12}=T_{13}$ 2)$T_{13}=X^2T_{12}$ 3)$T_{12}=xyT_{13}$ 4)$T_{12}+T_{13}=25$

4. The coeffricent of x^4 in $(1+x-2x^2)$ is
1)-45 2)45 3)-195 4)195

5. If in the expansion of $(1+x)^n$ the coefficient of pth term is p and (p+1) th term is q then p+q=___
1)n 2)n+1 3)n+2 4)n+3

6. In the expansion of $(1+x)^7$, T_{r-1},T_r, T_{r+1} terms coefficients are in A.P. then r=_
1)4 2)5 3)6 4)2

7. If the coefficient of x^7 in $[ax^2+1/bx]^{11}$ is equal to coefficient of x^{-7} in $[ax-1/bx^2]^{11}$ then a b=___
1)0 2)1 3)-1 4)2

8. The number of terms in the expansion of $(x+y+z)^n$ is
1)n 2)n+1 3) $\sum$ n 4) $\sum$ (n+1)

9. The number of terms in the expansion of $(x+y+z)^{20}$ is
1)231 2)210 3)61 4)60

10. The number of non-zero terms in the expansion of $(x+a)^{40}+(x-a)^{40}$ is
1)20 2)21 3)40 4)41

11. The middle term in the expansion of $[1+3x+3x^2+x^3]^{2n}$ is
1)$C(3n,n)x^n$ 2)$C(2n,n)x^n$ 3)$C(6n,3n)x^{3n}$ 4)$C(6n,2n)x^{2n}$

12. The middle term in the expansion of $\left(\frac{x\sqrt{y}}{5} - \frac{5}{y\sqrt{x}}\right)^{12}$ is
1)$C(12,7)x^4y^{-4}$ 2)$C(12,6)x^3y^{-3}$ 3)$C(12,7)x^{-3}y^3$ 4)$C(12,6)x^3y^3$

13. If in the expansion of $(1+x)^n$, 9th, 10th &11th terms coefficients are in A.P. Then n=__
1)11 2)12 3)14 4)16

14. $C_0+C_1+C_2+\ldots..+C_n$=___
1)2^n 2)2^{-1} 3)S^0 4)0

15. $C_1+2C_2+3C_3+\ldots..+nC_n$=__
1)2^n-1 2)$n.2^{n-1}$ 3)$n.2^n$ 4)$n(2^n-1)$

16. $C_0+C_1+2C_2(3)+3C_3(3)^2+4C_4(3)^3+\ldots..+nC_n(3)^{n-1}$=__
1)$n(3^n+1)$ 2)$n.4^{n-1}$ 3)$n.4^{n-1}+1$ 4)$n(4^{n-1}+1)$

17. $C_0-[C_1-2C_2+3C_3-\ldots.+\ldots.+(-1)^{n-1}\ nCn]$=___
1)0 2)$1-2^n$ 3)$1-n.2^{n-1}$ 4)1

18. $C_0+\frac{C_1}{2}(4)+\frac{C_2}{3}(16)+\ldots.+\frac{C_n}{n+1}(2)^{2n}$=___
1)$\frac{3^{n+1}-1}{2(n+1)}$ 2)$\frac{4^{n+1}-1}{4(n+1)}$ 3)$\frac{5^{n+1}-1}{4(n+1)}$ 4)$\frac{2^{n+1}-1}{2(n+1)}$

19. $2.\ C_2/C1\ +3.C_3/C_2+\ldots+nCn/C_{n-1}$ =____
1)C_0 2)C_1 3)C_2 4)C_3

20. $C_0\ C_4+C_1C_5+C_2C_6+\ldots.+C_{n-4}\ C_n$ =___
1) $\frac{2n!}{(n-1)!(n+1)!}$ 2) $\frac{2n!}{(n-2)!(n+2)!}$ 3) $\frac{2n!}{(n)!(n-3)!}$ 4) $\frac{2n!}{(n-4)!(n+4)!}$

21. $\frac{C_0}{1}+\frac{C_2}{3}+\frac{C_4}{5}+\ldots\ldots..\frac{C_{16}}{17}$
1)1/17 2)2/17 3)$2^{16}/17$ 4)$2^{17}/17$

22. $\frac{C_1}{2}+\frac{C_3}{4}+\ldots\ldots..\frac{C_{15}}{16}$
1)1/16 2)$2^{15}/16$ 3)$2^{16}/16$ 4)$(2^{15}-1)/16$

23. $1 + \frac{1}{2} . \frac{3}{5} + \frac{1.3}{2.4} . \frac{9}{25} + \frac{1.3.5}{2.4.6} . \frac{27}{125} + \ldots\ldots \infty =$

1) $\sqrt{5/2}$ 2) $\sqrt{2/5}$ 3) $\sqrt{3/5}$ 4) $\sqrt{5/3}$

24. $1 + 1/3 + (1.3)/3.6 + (1.3.5)/3.6.9 + \ldots\ldots \infty =$

1) $\sqrt{3}$ 2) $1/\sqrt{3}$ 3) $\sqrt{2/3}$ 4) $\sqrt{3/2}$

25. $1 + \frac{3}{4} + (3.5)/4.8 + (3.5.7)/4.8.12 + \ldots\ldots \infty =$

1) $\sqrt{2}$ 2) $\sqrt{3}$ 3) $2\sqrt{2}$ 4) $3\sqrt{3}$

26. $1 - \frac{1}{2}.1/2 + \frac{1.3}{2.4} . \frac{1}{2^2} - \frac{1.3.5}{2.4.6} . \frac{1}{2^3} + \frac{1.3.5.7}{2.4.6.8} . \frac{1}{2^4} - \ldots =$

1) $\sqrt{3/2}$ 2) $\sqrt{2/3}$ 3) $\sqrt{2}$ 4) $\sqrt{3}$

KEY

1) 3	2) 3	3) 3	4) 1	5) 2	6) 3	7) 1	8) 4	9) 1	10) 2
11) 3	12) 2	13) 3	14) 1	15) 2	16) 3	17) 4	18) 3	19) 3	20) 4
21) 3	22) 4	23) 1	24) 1	25) 3	26) 2				

7. PARTIAL FRACTIONS

1. An expression of the form $a_0x^n+a_1x^{n-1}+a_2x^{n-2}+\ldots+a_n$ where n is a positive integer and $a_0, a_1, a_2, \ldots a_n$ are real number and $a_0 \neq 0$ is called a polynomial of nth degree in x.

2. If f(x), g(x) are two polynomials and g(x) ≠0 then f(x)/g(x) is called a rational function

3. If a rational function can be expressed as sum of two or more proper fractions then each fraction is called a partial fraction of the given function.

4. A fraction f(x)/g(x) is said to be a proper fraction if deg f(x) < deg g(x)

5. A fraction f(x)/g(x) is said to be improper fraction if deg f(x) >deg g(x)

6. $f(x)/[(x+a)(x+b)] = f(-a)/[(x+a)(-a+b)] + f(-b) / [(x+b)(-b+a)]$

7. $1 / [x^3(x+a)] = 1/a^3x-1/a^2x^2+1/ax^3-1/a^3(x+a)$

8. $1 /[(x^2+a^2)(x^2+b^2)] = 1 / b^2-a^2[1/(x^2+a^2) - 1/(x^2+b^2)]$

9. $1/[(x-a)(x^2+b)] = (1/a^2-b)(1/x-a- x+a/x^2+b)$

10. Coefficient of x^n in $\frac{x}{(x-a)(x-b)}$ is $\frac{a^n-b^n}{(a-b)(a^nb^n)}$ if |x| <a and |x| <b

11. $(x-a)(x-b) = x^2-(a+b)\,x+ab$

12. $(x-a)(x-b)(x-c) =x^3-(a+b+c)\,x^2+ (ab+bc+ca)\,x-abc$

13. $a^3(b-c) +b^3(c-a) +c^3(a-b) = - (a+b+c)\,(a-b)\,(b-c)(c-a)$.

14. $$\frac{px+q}{x(x^2+a^2)} = \frac{q}{a^2x} + \frac{pa^2-qx}{a^2(x^2+a^2)}$$

15. $$\frac{px+q}{x^2(x-a)} = \frac{-q}{ax^2} - \frac{ap+q}{a^2x} + \frac{ap+q}{a^2(x-a)}$$

16. $$\frac{px+q}{x(x-a)^2} = \frac{q}{a^2x} - \frac{q}{a^2(x-a)} + \frac{ap+q}{a(x-a)^2}$$

17. $$\frac{1}{(ax+b)(cx+d)} = \frac{1}{ad-bc}\left[\frac{a}{ax+b} - \frac{c}{cx+d}\right]$$

18. To resolve the partial fractions of $\frac{ax^3+bx^2+cx+d}{(x+a)^4}$ put x + a = p.

Exercise-A

I. Find the number of partial fractions of

1. $(2x+3) / x^2(x^2-1)^3$
   1)2 2)4 3)8 4)10

2. $1/ x^4(x^3+1)$
   1)3 2)6 3)4 4)2

3. $(3x-5) / (x+1)^3 (x^2+1)^2$
   1)1 2)4 3)3 4)5

4. $(3x^2+1) / (x^2+1)^4$
   1)4 2)3 3)2 4)1

5. $(3x^2 +70x+93) / (x-1)^4$
   1)2 2)4 3)2 4)0

II Resolve into partial fractions:

6. 1 / (x-1) (x-2)
   1)-1/(x-1)+1/(x-2)2) 1/(x-1)+1/(x-2) 3) -1/(x-1)-1/(x-2) 4) 1/(x-1)-1/(x-2)

7. 1/ (x+1)(x-3)
   1)1/4[1/(x+1)+1/(x-3)] 2) 1/4[-1/(x+1)+1/(x-3)]
   3) 1/4[-1/(x+1)-1/(x-3)] 4) 1/2[-1/(x+1)+1/(x-3)]

8. (2x-3) / x(x+1)
   1)(-3/x)+5/(x+1) 2) (3/x)+5(x+1) 3) (-3/x)-5(x+1) 4) (3/x)-5(x+1)

III.

9. $(3x^2-5) / x(x-1)(x+1)$
   1)(5/x)-[1/(x-1)]-[1/(x+1)] 2) (5/x)+1/(x-1)-1/(x+1)
   3) (5/x)-1/(x-1)+1/(x+1) 4)(-5/x)+1/(x-1)-1/(x+1)

10. 1/ (x-a) (x-b) (x-c)
    1)1/[(x-a)(a-b)(a-c)]+1/[(x-b)(b-a)(b-c)]+1/[(x-c)(c-a)(c-b)]
    2) 1/[(x-a)(a-b)(a-c)]-1/[(x-b)(b-a)(b-c)]+1/[(x-c)(c-a)(c-b)]
    3) 1/[(x-a)(a-b)(a-c)]+1/[(x-b)(b-a)(b-c)]-1/[(x-c)(c-a)(c-b)]
    4) 1/[(x-a)(a-b)(a-c)]-1/[(x-b)(b-a)(b-c)]-1/[(x-c)(c-a)(c-b)]

IV.

11. $(x^2+3x+1) / (x-1)^3$

1)$1/(x-1)-5/(x-1)^2+5/(x-1)^3$ 2) $1/(x-1)+5/(x-1)^2+5/(x-1)^3$
3) $1/(x-1)+5/(x-1)^2-5/(x-1)^3$ 4) $1/(x-1)-5/(x-1)^2-5/(x-1)^3$

12. $(x^2-2x-1)/ (x+1)^3$
1)$1/(x+1)-4/(x+1)^2+2/(x+1)^3$ 2) $1/(x+1)+4/(x+1)^2+2/(x+1)^3$
3) $1/(x+1)-4/(x+1)^2-2/(x+1)^3$ 4) $1/(x+1)+4/(x+1)^2-2/(x+1)^3$

V.

13. $(2x+1)/ (x-1) (x-2)^2$
1)$3/(x-1)-3/(x-2)+5/(x-2)^2$ 2) $3/(x-1)+3/(x-2)+5/(x-2)^2$
3) $3/(x-1)-3/(x-2)-5/(x-2)^2$ 4) $-3/(x-1)-3/(x-2)+5/(x-2)^2$

14. $(3x-1)/ (x-3)(x-1)^2$
1)$8/4(x-3)-8/4(x-1)-1/(x-1)^2$ 2) $8/4(x-3)-8/4(x-1)+1/(x-1)^2$
3) $8/4(x-3)+8/4(x-1)-1/(x-1)^2$ 4) $8/4(x-3)+8/4(x-1)+1/(x-1)^2$

15. $(3x+1)/ (x-2) (x+1)^2$
1) $7/9(x-2)-7/9(x+1)+2/3(x+1)^2$ 2)$7/9(x-2)-7/9(x+1)-2/3(x+1)^2$
3) $7/9(x-2)+7/9(x+1)+2/3(x+1)^2$ 4) $-7/9(x-2)-7/9(x+1)+2/3(x+1)^2$

VI.

16. $(2x+1) / (x-1)(x-2) (x+2)^2$
1)$-1/3(x-1)+5/16(x-2)+1/48(x+2)-1/4(x+2)^2$
2) $-1/3(x-1)+5/16(x-2)+1/48(x+2)+1/4(x+2)^2$
3) $-1/3(x-1)+5/16(x-2)-1/48(x+2)-1/4(x+2)^2$
4) $1/3(x-1)+5/16(x-2)+1/48(x+2)-1/4(x+2)^2$

17. $1/ (x+1) (x+2) (x-1)^2$
1)$1/4(x+1)-1/9(x+2)-5/36(x-1)+1/6(x-1)^2$
2) $1/4(x+1)-1/9(x+2)-5/36(x-1)-1/6(x-1)^2$
3) $1/4(x+1)-1/9(x+2)+5/36(x-1)+1/6(x-1)^2$
4) $-1/4(x+1)-1/9(x+2)-5/36(x-1)+1/6(x-1)^2$

18. $1/x^2(x+1)^2$
1)$-2/x+2/x^2+2/(x+1)+1/(x+1)^2$ 2)$2/x+2/x^2+2/(x+1)+1/(x+1)^2$
3) $-2/x+2/x^2-2/(x+1)+1/(x+1)^2$ 4) $-2/x+1/x^2+2/(x+1)+1/(x+1)^2$

VIII.

19. $1/ x^2(x-1)^2$
1)$2/x+1/x^2-2/(x-1)+1/(x-1)^2$ 2) $-2/x+1/x^2-2/(x-1)+1/(x-1)^2$
3) $2/x-1/x^2-2/(x-1)+1/(x-1)^2$ 4) $2/x+1/x^2-2/(x-1)-1/(x-1)^2$

20. $(2x+1)/ (x-1) (x^2+2)$

1)$1/(x-1)+(-x+1)/(x^2+2)$ 2) $1/(x-1)-(-x+1)/(x^2+2)$

3) $-1/(x-1)+(-x+1)/(x^2+2)$ 4) $1/(x-1)+(-x+1)/(x^2-2)$

21. $(x+1)^2/ (x^3 +x)$

1)$1/x-2/(x^2+1)$ 2) $1/x+2/(x^2+1)$ 3) $-1/x+2/(x^2+1)$ 4) $-1/x-2/(x^2+1)$

IX.

22. $(x^2-x+1)/ (x^2-3x+2)$

1)$1+[1/(x-1)+3/(x-2)]$ 2) $1-[1/(x-1)+3/(x-2)]$

3) $-1-[1/(x-1)+3/(x-2)]$ 4) $1-[1/(x-1)-3/(x-2)]$

23. $x^4/ (x-1) (x-2)$

1)$(x^2+3x+7)-1/(x-1)-16(x-2)$ 2) $(x^2+3x+7)+1/(x-1)+16(x-2)$

3) $(x^2+3x+7)-1/(x-1)+16(x-2)$ 4) $(x^2-3x+7)-1/(x-1)+16(x-2)$

X.

24. $(x^2+1)/ (x-1) x^4$

1)$-2/x-2/x^2-1/x^3-1/x^4+2/(x-1)$ 2) $2/x-2/x^2-1/x^3-1/x^4+2/(x-1)$

3) $-2/x-2/x^2+1/x^3-1/x^4+2/(x-1)$ 4) $-2/x+2/x^2-1/x^3-1/x^4+2/(x-1)$

25. $(4x+1) / (x-1) x^6$

1)$5/x-5/x^2-5/x^3-5/x^4-5/x^5-1/x^6+5/(x-1)$

2) $-5/x+5/x^2-5/x^3-5/x^4-5/x^5-1/x^6+5/(x-1)$

3) $-5/x-5/x^2+5/x^3-5/x^4-5/x^5-1/x^6+5/(x-1)$

4) $-5/x-5/x^2-5/x^3-5/x^4-5/x^5-1/x^6+5/(x-1)$

26. $1/ (x^2+a^2) (x^2+b^2)$

1)$[1/(-a^2+b^2)(x^2+a^2)]+[1/(-b^2+a^2)(x^2+b^2)]$

2) $-1/(-a^2+b^2)(x^2+a^2)+1/(-b^2+a^2)(x^2+b^2)$

3) $1/(-a^2+b^2)(x^2+a^2)-1/(-b^2+a^2)(x^2+b^2)$

4) $-1/(-a^2+b^2)(x^2+a^2)-1/(-b^2+a^2)(x^2+b^2)$

27. $x^2/(x^2+a^2) (x^2+b^2)=$_____

1)$1/(a^2-b^2)[a^2/(x^2+a^2)- b^2/x^2+b^2]$

2)$1/(b^2-a^2) [a^2/(x^2+a^2)- b^2/x^2+b^2]$

3)$1/2(a^2-b^2)[a^2/(x^2+a^2)- b^2/x^2+b^2]$

4)$1/2(b^2-a^2) [a^2/(x^2+a^2)- b^2/x^2+b^2]$

28. $(3x^2+2) /(x^2-4)(x^2+6)$

1)$1/5[7/(x^2-4) + 8/(x^2+6)]$ 2)$1/2[7/(x^2-4) + 8/(x^2+6)]$

3)$1/3[7/(x^2-4) + 8/(x^2+6)]$ 4)$1/4[7/(x^2-4) + 8/(x^2+6)]$

29. If $(7x-1)/(1-5x+6x^2)$ is expanded then coefficient of x^n is_____
1)$5.2^n+4.3^n$ 2)$-5.2^n+4.3^n$ 3)$5.2^n-4.3^n$ 4)$-5.2^n-4.3^n$

30. If $|x|<2$ coefficient of x^3 in $(5x+1)/(x+2)(x-1)$ is_____
1)35/16 2)25/16 3)-35/16 4)-25/16

31. If $2x/(x^4+x^2+1)= A/(x^2-x+1) +B/(x^2+x+1)$ then AB=_____
1)1 2)-1 3)2 4)-2

32. I: If $\frac{1}{x^2-9} = \frac{1}{k}\left(\frac{1}{x-3} - \frac{1}{x+3}\right)$, then k=6.
II: If $\frac{1}{x^2-16} = \frac{1}{k}\left(\frac{1}{x-4} - \frac{1}{x+4}\right)$, then k=6.

1)Only I is true 2)Only II is true 3)Both I& II are true 4)Neither I nor II are true

33. Match the following.

I. If $\frac{3x}{(x-6)(x+k)} = \frac{2}{x-6} + \frac{1}{x+k}$ then k=	a)0
II. If $\frac{3x-6}{(x-6)(x+k)} = \frac{2}{x-6} + \frac{1}{x+k}$ then k=	b)3
III. If $\frac{x-4}{x^2-5x-2k} = \frac{2}{x-2} - \frac{1}{x+k}$ then k=	c)-1
IV. If $\frac{3x^3-2x^2-1}{x^4+x^2+1} = \frac{Ax+B}{x^2+x+1} + \frac{Cx+D}{x^2+kx+1}$ then k=	d)-3

a)c,d,b,a b)b,a,d,c 3)c,a,b,d 4)c,b,a,d

34. A: The remainder of x^3+2x^2-5x-3 when divided by x-2 is 3.
R: The remainder of the polynomial f(x) when divided by x-a is f(a).
1) Both A and R are true and R is the correct explanation of A
2) Both A and R are true but R is not correct explanation of A
3) A is true but R is false
4) A is false but R is true

PREVIOUS EAMCET PROBLEMS

Resolve into partial fractions:

35. $[x^4+24x^2+28] / (x^2+1)^3$=_____ [1986]
1)$1/(x^2+1)+22/(x^2+1)^2+5/(x^2+1)^3$
2) $1/(x^2+1)-22/(x^2+1)^2+5/(x^2+1)^3$
3) $1/(x^2+1)+22/(x^2+1)^2-5/(x^2+1)^3$
4) $1/(x^2+1)-22/(x^2+1)^2-5/(x^2+1)^3$

36. The remainder obtained when the polynomial $1+x+x^3+x^9+x^{27}+x^{81}+x^{243}$ is divided by $x-1$ is
1)3 2)5 3)7 4)11

37. The remainder obtained when the polynomial $x^{64}+x^{27}+1$ is divided by $x+1$ is
1)1 2)-1 3)2 4)-2

38. Resolve into partial fractions: $(3x+7)/(x^2-3x+2)$ [1993]
1)-10/(x-1)+13/(x-2) 2) -10/(x-1)-13/(x-2)
3) 10/(x-1)+13/(x-2) 4) -1/(x-1)+13/(x-2)

39. $(3x+4)/(x+1)^2 (x-1) = A/(x-1)+B/(x+1) +C/(x+1)^2$ then A= [1994]
1)7/4 2)1/4 3)1 4)10/3

40. $(3x+4) /(x^2-3x+2) = A/(x-2)-B /(x-1)$ then (A,B)=_____ [1996]
1)(7,10) 2)(10,7) 3)(10,-7) 4)(-10,7)

41. $(x+1)^2 /(x^3+x) = A/x + (Bx+C)/(x^2+1)$, $\sin^{-1} (A/C)$=____ [1997,98]
1)π/6 2) π/4 3) π/3 4) π//2

42. If 1 / (1-2x) (1+3x) = A/ (1-2x) + B /(1+3x) then 2B=____ [1999]
1)A 2)2A 3)3A 4)-3A

43. If $(x^2+5) / (x^2+2)^2 = 1/ (x^2+2) + k / (x^2+2)^2$ then K= ____ [2000]
1)1 2)2 3)3 4)4

44. If $(x-4) / (x^2-5x-2k) = 2/(x-2) - 1/(x+k)$ then K =____ [2001]
1)-3 2)-2 3)2 4)3

45. 1/[(1-x)(1-2x)(1-3x)]=a/(1-x) +b/(1-2x) +c/(1-3x) then a/1+b/3+c/5=___ (2003)
1)1/15 2)1/6 3)1/5 4)1/336.

46. If (x+1) / (2x-1) (1+3x) = A/ (2x-1) + B /(1+3x) then 16A+9B=____ [2004]
1)4 2)5 3)6 4)8

47. If $(x-4)/ x^2-5x+6$ can be expanded in the ascending powers of x, then the coefficient of x^3 is
1)-73/648 2)73/648 3)71/648 4)-71/648 [2004]

48. $\frac{x^3}{(2x-1)(x+2)(x-3)} = A + \frac{B}{2x-1} + \frac{C}{x+2} + \frac{D}{x-3} \Rightarrow A=$___ (2005)
1)1/2 2)-1/50 3)-8/25 4)27/25

49. If $\frac{3x+2}{(x+1)(2x^2+3)} = \frac{A}{x+1} + \frac{Bx+C}{2x^2+3}$ then A+C-B =____ (2006)

1)2 2)7 3)3 4)5

50. If $\frac{3x}{(x-a)(x-b)} = \frac{2}{x-a} + \frac{1}{x-b}$ then a:b = (2007)

1)1:2 2)-2:1 3)1:3 4)3:1

51. $(2x+3)/(1-x+x^2)(x-2)$=_____

1)$7/3(x-2)- (7x+1)/3(x^2-x+1)$ 2)$7/2(x-2)- (7x+1)/3(x^2-x+1)$

3)$7/4(x-2)- (7x+1)/3(x^2-x+1)$ 4)$3/2(x-2)- (7x+1)/3(x^2-x+1)$

52. 1 / (x-a) (x-b)

1)1/(a+b)[1/(x-a)+1/(x-b)] 2) 1/a[1/(x-a)+1/(x-b)]

3) (1/b)[1/(x-a)+1/(x-b)] 4) 1/(a-b)[1/(x-a) - 1/(x-b)]

53. If $\frac{x^2+x+1}{x^2+2x+1} = A + \frac{B}{x+1} + \frac{C}{(x+1)^2}$ then A-B= (2008)

1)4C 2)4C+1 3)3C 4)2C

54. For |x| < 1, the constant term in the expansion of $\frac{1}{(x-1)^2(x-2)}$ is: (2009)

1) 2 2) 1 3) 0 4) $-\frac{1}{2}$

55. For $|x| < \frac{1}{5}$, the coefficient of x^3 in the expansion of $\frac{1}{(1-5x)(1-4x)}$ is : (2010)

1) 369 2) 370 3) 371 4) 372

. $\frac{x^2+x+1}{(x-1)(x-2)(x-3)} = \frac{A}{x-1} + \frac{B}{x-2} + \frac{C}{x-3} \Rightarrow A+C =$ [2011]

1) 4 2) 5 3) 6 4) 8

56.

$$\frac{1}{x(x+1)(x+2).....(x+n)} = \frac{A_0}{x} + \frac{A_1}{x+1} + \frac{A_2}{x+2} + ...+ \frac{A_n}{x+n}, 0 \le r \le n \Rightarrow A_r =$$

[2012]

1) $(-1)^r \frac{r!}{(n-r)!}$ 2) $(-1)^r \frac{1}{r!(n-r)!}$ 3) $\frac{1}{r!(n-r)!}$ 4) $\frac{r!}{(n-r)!}$

57. If $\frac{1}{x^4+x^2+1} = \frac{Ax+B}{x^2+x+1} + \frac{C+D}{x^2-x+1}$, then Cx + D = [2013]

1) -1 2) 1 3) 2 4) 0

58. $\frac{2x^3+x^2-5}{} = \frac{Ax+B}{} + \frac{Cx+1}{} \Rightarrow (A.B.C) =$ (2014)

1) (1, 1, 0) 2) (1, 0, 1) 3) (1, 2, 1) 4) (1, 1, 1)

59. The coefficient of x^n in the expression of $\frac{1}{x^2-5x+6}$ for |x| < 1 is (2015)

1) $\frac{1}{2^{n-1}}-\frac{1}{3^{n-1}}$ 2) $\frac{1}{2^{n+2}}-\frac{1}{3^{n+2}}$ 3) $\frac{1}{2^{n+1}}-\frac{1}{3^{n+1}}$ 4) $\frac{1}{2^{n}}-\frac{1}{3^{n}}$

60. If |x| < 1 then the coefficient of x^5 in the expansion of $\frac{3x}{(x-2)(x+1)}$ is (2015 A.P)

1) $\frac{33}{32}$ 2) $-\frac{33}{32}$ 3) $\frac{31}{32}$ 4) $-\frac{31}{32}$

61. $\frac{x+1}{x^4(x+2)} = \frac{A}{x}+\frac{B}{x^2}+\frac{C}{x^3}+\frac{D}{x^4}+\frac{E}{x+2} \Rightarrow B+D+E =$ (2016)

1) A + C 2) A – C 3) 2A + C 4) 2A + 2C

62. To find the coefficient of x^4 in the expansion of $\frac{3x}{(x-2)(x-1)}$ the interval in which the expansion is valid is (2016AP)

1) $-2<x<\infty$ 2) $-\frac{1}{2}<x<\frac{1}{2}$ 3) $-1<x<1$ 4) $-\infty<x<\infty$

63. If $\frac{x^2+5}{(x^2+1)(x-2)} = \frac{A}{x-2}+\frac{Bx+C}{x^2+1}$, then A + B + C = (2017)

1) -1 2) $\frac{2}{5}$ 3) $\frac{-3}{5}$ 4) 0

64. If $\frac{x^3+x^2+1}{(x^2+2)(x^2+3)} = \frac{Ax+B}{x^2+2}+\frac{Cx+D}{x^2+3}$, then A + B + C + D = (2017AP)

1) 1 2) 4 3) 3 4) 2

KEY

1) 3	2) 2	3) 4	4) 1	5) 2	6) 12	7) 1	8) 1	9) 1	10) 1
11) 2	12) 1	13) 1	14) 1	15) 2	16) 11	17) 1	18) 1	19) 1	20) 1
21) 2	22) 4	23) 3	24) 14	25) 1	26) 1	27) 1	28) 1	29) 2	30) 3
31) 2	32) 1	33) 2	34) 1	35) 1	36) 3	37) 3	38) 1	39) 1	40) 1
41) 1	42) 3	43) 3	44) 1	45) 1	46) 3	47) 1	48) 1	49) 1	50) 2
51) 1	52) 4	53) 4	54) 4	55) 4	56) 2	57) 4	58) 2	59) 3	60) 2
61) 1	62) 3	63) 3	64) 4	65)	66)	67)	68)	69)	70)

Exercise-B

1. The partial fraction of $\frac{x^2+1}{x\left(x^2-1\right)}$ are

1) $\frac{1}{x}-\frac{1}{x+1}+\frac{1}{x-1}$ 2) $-\frac{1}{x}+\frac{1}{x+1}+\frac{1}{x-1}$

3) $\frac{1}{x}-\frac{1}{x+1}+\frac{1}{x-1}$ 4) $\frac{1}{x}+\frac{1}{x+1}-\frac{1}{x-1}$

2. If $\frac{x^4}{(x-a)(x-b)(x-c)}=P(x)+\frac{A}{x-a}+\frac{B}{x-b}+\frac{C}{x-c}$ then P(x)=

1) x-a 2) x-a-b 3) x-a-b-c 4) x+a+b+c

3. The partial fractions of $\frac{6x^4+5x^3+x^2+5x+2}{1+5x+6x^2}$ are

1) $x^2-\frac{1}{1+2x}+\frac{1}{1+3x}$ 2) $x^2+\frac{1}{1+2x}+\frac{1}{1+3x}$

3) $x^2+\frac{1}{1+2x}-\frac{1}{1+3x}$ 4) $-x^2+\frac{1}{1+2x}-\frac{1}{1+3x}$

4. The partial fractions of $\frac{1}{\left(x^2+9\right)\left(x^2+16\right)}$

1) $\frac{1}{7}\left[\frac{1}{x^2+9}-\frac{1}{x^2+16}\right]$ 2) $\frac{1}{9}\left[\frac{1}{x^2+9}-\frac{1}{x^2+16}\right]$

3) $\frac{1}{9}\left[\frac{1}{x^2+16}-\frac{1}{x^2+9}\right]$ 4) $\frac{1}{25}\left[\frac{1}{x^2+9}-\frac{1}{x^2+16}\right]$

5. $\frac{3x^2+x+1}{(x-1)^4}=\frac{A}{x^2+1}+\frac{B}{\left(x^2+1\right)^2}+\frac{C}{\left(x^2+1\right)^3}$ then A+B+C=

1) 0 2) 15 3) 1 4) 10

6. If $\frac{x^4+24x^2+28}{\left(x^2+1\right)^3}=\frac{A}{x^2+1}+\frac{B}{\left(x^2+1\right)^2}+\frac{C}{\left(x^2+1\right)^3}$

1) 26 2) 27 3) 28 4) 29

7. The partial fractions of $\frac{x^2+13x+15}{(2x+3)(x+3)^2}$ are

1) $\frac{1}{2x+3}-\frac{1}{x+3}+\frac{5}{(x+3)^2}$ 2) $\frac{1}{2x+3}+\frac{1}{x+3}+\frac{5}{(x+3)^2}$

3) $\frac{-1}{2x+3}-\frac{1}{x+3}+\frac{5}{(x+3)^2}$ 4) $\frac{1}{2x+3}+\frac{1}{x+3}+\frac{5}{(x+3)^2}$

8. The partial fractions of $\frac{(x+1)^2}{x(x^2+1)}$ are

1) $\frac{1}{2x}+\frac{x}{x^2+1}$ 2) $\frac{1}{x}-\frac{2}{x^2+1}$ 3) $\frac{1}{x}+\frac{1}{x^2+1}$ 4) $\frac{1}{x}+\frac{2}{x^2+1}$

9. If $\frac{1}{(x-a)(x^2+b)}=\frac{A}{x-a}+\frac{Bx+C}{x^2+b}$ then $\frac{1}{(x-a)(x^2+b)^2}=$

1) $\frac{A^2}{x-a}+\frac{A(Bx+C)}{x^2+b}+\frac{Bx+C}{(x^2+b)^2}$ 2) $\frac{A^2}{x+a}+\frac{A(Bx+C)}{x^2+b}+\frac{Bx+C}{(x^2-b)^2}$

3) $\frac{A^2}{x+a}+\frac{A(Bx+C)}{x^2+b}+\frac{Bx-C}{(x^2+b)^2}$ 4) $\frac{A^2}{x-a}+\frac{A(Bx-C)}{x^2-b}+\frac{Bx+C}{(x^2-b)^2}$

10. The coefficient of x^n in $\frac{1}{(x-1)^2(x-2)}$ is

1) $1-2n-\frac{3}{2^{n+1}}$ 2) $1-2n-\frac{3}{2^{n-1}}$

3) $1+2n+\frac{3}{2^{n+1}}$ 4) $1+2n-\frac{3}{2^{n-1}}$

11. $(x^2+1)/(x-1)x^4$

1) $-2/x-2/x^2-1/x^3-1/x^4+2/(x-1)$ 2) $2/x-2/x^2-1/x^3-1/x^4+2/(x-1)$

3) $-2/x-2/x^2+1/x^3-1/x^4+2/(x-1)$ 4) $-2/x+2/x^2-1/x^3-1/x^4+2/(x-1)$

12. $(4x+1)/(x-1)x^6$

1) $5/x-5/x^2-5/x^3-5/x^4-5/x^5-1/x^6+5/(x-1)$

2) $-5/x+5/x^2-5/x^3-5/x^4-5/x^5-1/x^6+5/(x-1)$

3) $-5/x-5/x^2+5/x^3-5/x^4-5/x^5-1/x^6+5/(x-1)$

4) $-5/x-5/x^2-5/x^3-5/x^4-5/x^5-1/x^6+5/(x-1)$

13. $(2x+3)/(1-x+x^2)(x-2)=$_____

1) $7/3(x-2)-(7x+1)/3(x^2-x+1)$ 2) $7/2(x-2)-(7x+1)/3(x^2-x+1)$

3) $7/4(x-2)-(7x+1)/3(x^2-x+1)$ 4) $3/2(x-2)-(7x+1)/3(x^2-x+1)$

KEY

1) 2	2) 4	3) 2	4) 1	5) 1	6) 3	7) 2	8) 4	9) 1	10) 1
11) 1	12) 4	13) 1	14)	15)	16)	17)	18)	19)	20)

AIEEE PROBLEMS

1. If the expansion in powers of x of the function $\frac{1}{(1-ax)(1-bx)}$ is $a_0+a_1x+a_2x_2+a_3x_3+\ldots$, then a_n is [2006]

1) $\frac{a^{n+1}-b^{n+1}}{b-a}$ 2) $\frac{b^{n+1}-a^{n+1}}{b-a}$ 3) $\frac{b^n-a^n}{b-a}$ 4) $\frac{a^n-b^n}{b-a}$

8.MEASURES OF DISPERSION

SYNOPSIS

Range, Mean deviation, Variance, Standard deviation are some measures of dispersion.

Range: - Range is defined as the difference of maximum value & the minimum value of the data.

Mean Deviation for ungrouped distribution.

i) Mean Deviation about the mean = $\frac{1}{n}\sum\left|x_i - \bar{x}\right|$

ii) Mean Deviation about median = $\frac{1}{n}\sum\left|x_i - \text{Median}\right|$

Mean Deviation for grouped data.

i) Mean deviation about mean = $\frac{1}{N}\sum f_i\left|x_i - \bar{x}\right|$, where N = $\sum f_i$

ii) Mean Deviation about median = $\frac{1}{N}\sum f_i\left|x_i - \text{Median}\right|$, where $\sum f_i$

Variance & standard deviation for ungrouped data

$$\sigma^2 = \frac{1}{N}\sum\left(x_i - \bar{x}\right)^2, \sigma = \sqrt{\frac{1}{n}\sum\left(x_i - \bar{x}\right)^2}$$

Variance & standard deviation of a discrete frequency distribution.

$$\sigma^2 = \frac{1}{N}\sum f_i\left(x_i - \bar{x}\right)^2, \sigma = \sqrt{\frac{1}{n}\sum f_i\left(x_i - \bar{x}\right)^2}$$

Variance & standard deviation of a discrete frequency distribution

$\sigma = \frac{1}{N}\sqrt{N\sum f_i x_i^2 - \left(\sum f_i x_i\right)^2}$ (or) $\sigma = \frac{1}{N}\sqrt{N\sum f_i y_i^2 - \left(\sum f_i y_i\right)^2}$ where $y_i = \frac{\left(x_i - A\right)}{h}$

Coefficient of variation = $\frac{\sigma}{\bar{x}} \times 100; \bar{x} \neq 0$

Exeercise – A

1. A data has highest value 120 & lowest value 71. A frequency distribution in descending order with seven classes is to be constructed. The limits of the second calss-interval shall be:
   1) 71 & 78 2) 78 & 85 3) 113 & 120 4) 106 & 113

2. If the sum of 11 consecutive natural numbers is 2761, then the middle number:
   1) 249 2) 250 3) 251 4) 252

3. Mean of 100 items is 49. It was discovered that three item which should have been 60, 70, 80 were wrongly read as 40, 20, 50 respectively. The correct mean is:
   1) 48 2) 82 3) 50 4) 80

4. The average of the squares of the numbers 0, 1, 2, 3, 4, ……, n is:

1) $\frac{1}{2}n(n+1)$ 2) $\frac{1}{6}n(2n+1)$ 3) $\frac{1}{6}(n+1)(2n+1)$ 4) $\frac{1}{6}n(n+1)$

5. If the average of the numbers 148, 146, 144, 142, …. In AP, be 125, then the total numbers in the series will be:
1) 18 2) 24 3) 30 4) 48

6. The mean of the values of 1, 2, 3, ….., n with respectively frequencies x, 2x, 3x, ……, nx is
1) $\frac{n}{2}$ 2) $\frac{1}{3}(2n+1)$ 3) $\frac{1}{6}(2n+1)$ 4) $\frac{n}{2}$

7. The mean of n items is $\overline{X}$ If the first term is increased by 1, second by 2 & so on, then the new mean is:
1) $\overline{X}+n$ 2) $\overline{X}+\frac{n}{2}$ 3) $\overline{X}+\frac{n+1}{2}$ 4) None of these

8. If the mean of n observations 1^2 , 2^2, 3^2, …….., n^2 is $\frac{46n}{11}$, then n is equal to:
1) 11 2) 12 3) 23 4) 22

9. The standard deviation of the observations 22, 26, 28, 20, 24, 30 is
1) 2 2) 24 3) 3 4) 3.42

10. The SD of 15 items is 6 &, if each item is decreases by 1, then standard deviation will be:
1) 5 2) 7 3) $\frac{91}{15}$ 4) 6

11. The weighted AM of first n natural numbers whose weights are equal to the corresponding numbers is equal to:
1) 2n+1 2) $\frac{1}{2}(2n+1)$ 3) $\frac{1}{3}(2n+1)$ 4) $\frac{2n+1}{6}$

12. The AM of the series 1, 2, 4, 8, 16, ……. 2^n is:
1) $\frac{2^n-1}{n}$ 2) $\frac{2^{n+1}-1}{n+1}$ 3) $\frac{2^n+1}{n}$ 4) $\frac{2^n-1}{n+1}$

13. In a moderately skewed distribution the values of mean & median are 5 & 6 respectively. The value of mode in such a situation is approximately equal to:
1) 8 2) 11 3) 16 4) None of these

14. Coefficient of skewness for the values Median = 18.8, Q_1 = 14.6, Q_3=25.2 is:
1) 0.2 2) 0.5 3) 0.7 4) None of these

15. For a series the value of mean deviation is 15, the most likely value of its quartile deviation is:
1) 12.5 2) 11.6 3) 13 4) 9.7

16. The mean of five observations is 4 & their variance is 5.2. If three of them are 1, 2, 6 then other two are:
1) 2, 9 2) 4, 7 3) 5, 6 4) 2, 10

17. The algebraic sum of the deviation of 20 observations measured from 30 is 2. Then mean of observations is:
1) 28.5 2) 30.1 3) 30.5 4) 29.6

18. The mean deviation of any series is 15, then value of quartile deviation is:
1) 10.5 2) 11.5 3) 12.5 4) 13.5

19. In a class of 100 students there are 70 boys whose average marks in a subject are 75. If the average marks of the complete class is 72, then what is the average of the girls:
1) 73 2) 65 3) 68 4) 74

20. The median of a set of 9 distinct observations is 20.5. If each of the largest 4 observations of the set is increased by 2, then the median of the new set:
1) Is increased by 2 2) Is decreased by 2
3) Is two times the original median
4) Remains the same as that of the original set

21. The mean of 30 given numbers, when it is given that the mean of 10 of them is 12 & the mean of the remaining 20 is 9, is equal to:
1) 11 2) 10 3) 9 4) 5

22. Mean of 100 observations is 45. It was later found that two observations 19 & 31 were incorrectly recorded as 91 & 13. The correct mean is:
1) 44 2) 45 3) 44.46 4) 45.54

23. In a class of 100 students, the average amount of pocket money is Rs. 35 per student. If the average is Rs. 25 for girls & Rs. 50 for boys, then the number of girls in the class is:
1) 20 2) 40 3) 60 4) 80

24. The mode of the distribution is

Marks	Number of students
4	6
5	7
6	10
7	8
8	3

1) 5 2) 6 3) 8 4) 10

25. A group of 10 items has arithmetic mean 6. If the arithmetic mean of 4 of these items is 7.5, then the mean of the remaining item is:
1) 6.5 2) 5.5 3) 4.5 4) 5.0

KEYS

1) 2	2) 3	3) 3	4) 2	5) 2	6) 2	7) 3	8) 1	9) 4	10) 4
11) 3	12) 2	13) 1	14) 1	15) 1	16) 2	17) 2	18) 3	19) 2	20) 4
21) 2	22) 3	23) 3	24) 2	25) 4	26)	27)	28)	29)	30)

PREVIOUS EAMCET QUESTIONS

1. The mean of four observation is 3. If the sum of the squares of these observations is 48 then their standard deviation is **(2014)**
1) $\sqrt{2}$ **2)** $\sqrt{3}$ 3) $\sqrt{5}$ 4) $\sqrt{7}$

2. If $x_1, x_2, \ldots\ldots\ldots x_n$ are n observations such that $\sum_{i=1}^{n} x_i^2 = 400$ & $\sum_{i=1}^{n} x_i = 80$ then the least value of n is **(2014)**
1) 12 2) 15 **3) 16** 4) 18

3. In a data the number is repeated i times for i = 1, 2, …..n. Then the mean of the data is **(2015)**
1) $\frac{2n+1}{6}$ 2) $\frac{2n+1}{4}$ **3)** $\frac{2n+1}{3}$ 4) $\frac{2n+1}{2}$

4. Two teams A & B have the same mean & their coefficient of variation are 4, 2 respectively. If $\overset{\sigma}{A}\overset{\sigma}{B}$ are the standard deviation of teams A, B respectively then the relation between them is **(2015)**
1) $\overset{\sigma}{A} = \overset{\sigma}{B}$ 2) $\overset{\sigma}{B} = 2\overset{\sigma}{A}$ **3)** $\overset{\sigma}{A} = 2\overset{\sigma}{B}$ 4) $\overset{\sigma}{B} = 4\overset{\sigma}{A}$

5. If the meridian of the data 6, 7, x – 2, x, 18, 21 written in ascending order is 16, then the variance of that data is **(2015 A.P)**
1) $30\frac{1}{5}$ **2)** $31\frac{1}{3}$ 3) $32\frac{1}{2}$ 4) $33\frac{1}{3}$

6. The arithmetic mean of the observations 10, 8, 5, a, b is 6 & their variance is 6.8. then ab = (2015 A.P)
1) 6 2) 4 3) 3 4) 12

7. If the average of the first n numbers in the sequence 148, 146, 144 …….. is 125, then n = (2016)
1) 18 2) 24 3) 30 4) 36

8. The standard deviation of a, a+d, a+2d, ……, a+2nd is (2016)

1) nd 2) n^2d 3) $\sqrt{\frac{n(n+1)}{3}}d$ 4) $\sqrt{\frac{n(n+3)}{3}}d$

9. If the mean of 10 observations is 50 & the sum of the squares of the deviations of the observations from the mean is 250, then the coefficient of variation of those observations is (2016AP)

1) 25 2) 50 3) 10 4) 5

10. The variance of the first 50 even natural numbers is (2016AP)

1) $\frac{833}{4}$ 2) 833 3) 437 4) $\frac{437}{4}$

11. The mean deviation from the mean 10 of the data 6, 7, 10, 12, 13, α, 12, 16 is (2017)

1) 3.5 2) 3.25 3) 3 4) 3.75

12. Let a & b be two real numbers. If the arithmetic mean & the varaiance of a, b, 8, 5 & 10 are respectively 6 & 6.8 then an ordered pair (a, b) = (2017AP)

1) (3, 4) 2) (1, 6) 3) (7, 0) 4) (-2, 9)

13. The mean deviation from the mean of the data given below is (2017AP)

Marks:	10	15	20	25	30
Number of students	2	4	6	8	5

1) 5 2) 5.12 3) 5.25 4) 5.6

KEYS

1) 2	2) 3	3) 3	4) 3	5) 2	6) 4	7) 2	8) 2	9) 1	10) 2
11) 2	12) 1	13) 2	14)	15)	16)	17)	18)	19)	20)
21)	22)	23)	24)	25)	26)	27)	28)	29)	30)

9. PROBABILITY

1. Random Experiment: - If an experiment is conducted any number of times under essentially identical conditions, there is a set of all possible outcomes associated with it. If the result is not certain and is any one of the several possible outcomes, then the experiment is called the trail or a random experiment.
   Example: - a) Tossing of a coin is a trail
   b) Rolling of a die is a trail
   c) Drawing three cards from pack of cards is a trail.

2. Sample space : - The set of all possible outcomes of an experiment is called the sample space or probability space . The elements of the sample space are called sample points

3. Event: - every subset of a sample space is an event.

4. Simple event or elementary event: A subset of a sample space which has only one element is a simple event.

5. Equally likely events: events are said to be equal likely when there is no reason to expect any one of them rather than any one of the others.

6. Mutually exclusive events:- Two events are said to be mutually exclusive if they cannot occur together i.e. no sample point is common to the two events.

7. Independent event:-If two events happen such that the occurrence of one does not depend upon that of the other they are said to be independent events.

8. Dependent events:- if two events take place such that the occurrence of one depends upon that of the other , they are said to be dependent events.

9. If A and B are mutually exclusive events, they can't be independent and vice versa

10. Definition of probability: $P(E) = \dfrac{\text{number of favourable events}}{\text{total number of events}}$

    If $\bar{E}$ denotes the event of non – occurrence of E then the probability of non-occurrence of E is $P(\bar{E}) = 1-P(E) \Rightarrow P(E)+P(\bar{E})=1$

11. If E is any event in the random experiment then $0 \leq P(E) \leq 1$, i.e the probability of an event lies between 0 and 1

12. If $\varnothing$ is an impossible event then $P(\varnothing) = 0$

13. If two events A and B are such that $A \leq B$ then $P(A) \leq P(B)$

ADDITION THEOREM:-

14. If A and B are two arbitrary events in a sample space 'S' then the probability of the occurrence of either of them is
$P(A \cup B) = P(A)+P(B)-P(A \cap B)$

15. If A and B are mutually exclusive events then
i) $P(A \cup B) = P(A)+P(B)$ ii) $P(A \cap B)=0$

16. A,B,C are three events
$P(A \cup B \cup C)=P(A)+P(B)-P(A \cap B) - P(A \cap C) - P(B \cap C) +P(A \cap B \cap C)$

17. A, B and C are mutually exclusive events then
$P(A \cup B \cup C) = P(A) +P(B)+P(C)$

18. Conditional probability : If A and B are two events in a sample space such that B occurs only if A has already occurred then the occurrence of B after the occurrence of A is denoted by P(B/A) and is called the conditional probability of B under the condition that A has already occurred.

19. Odds favour of the event: let E be any event in a trail then the odd favour of E is defined as $P(E) : P(\bar{E})$

20. Odds Against of the event: let E be any event in a trial then the odds against of E is defined as $P(E) : P(\bar{E})$

21. If A,B are independent event then
   i) $P(A \cap B) = P(A)\, P(B)$

   ii) $P(A \cup B) = 1- P(\bar{A} \cap \bar{B})$

   $= 1- P(\bar{A}) \,.\, P(\bar{B})$

   iii) $P(A \cap B) = P(A).P(B)$

   iv) $P(A/B) = P(A)$
   v) $P(B/A) =P(B)$

22. If A,B,C, are independent events then
   i) $P(A \cap B \cap C) = P(A)\, P(B)\, P(C)$

   ii) $P(A \cup B \cup C)= 1- P(\bar{A})\, P(\bar{B})\, P(\bar{C})$

23. If odds in favour of E is a:b then P(Favour of E) = a/(a+b) P(unfavour of E) = b/(a+b).

24. If odds against of the event E is c:d then P(Unfavour of E) = d/(c+d), P(Favour of E)= c/(c+d)

25. A,B are two events and $P(A) \neq 0$, $P(B) \neq 0$ then
    i) $P(A/B) = P(A \cap B) / P(B)$
    ii) $P(B/A) = P(A \cap B)/P(A)$

26. IF A,B are two events such that $\overline{P}(B)>0$ then $P(A/B) + P(A/B)=1$

27. (i) $P(\bar{A} U \bar{B}) = 1- P(A \cap B)$
    ii) $P(AUB) = 1- P(A \cap B)$
    iii) $P(A \cap B) = P(B) - P(A \cap B)$
    iv) $P(A \cap B) = P(A)- P(A \cap B)$
    v) $P(A/B) = 1-P(AUB) / 1- P(B)$

28. A coin is tossed 'n' times. The probability of getting 'r' head and 'n-r' tails is $nc_r / 2^n$.

29. Out of (2n+1) tickets consequently numbered '3' are drawn at random. The probability that the number on them are in A.P is $3n/4n^2-1$

30. Conditional probability: If A and B are two events in sample space and $p(A)\neq 0$. then the probability of B after the event A has occurred is called the conditional probability of B and is denoted by P(B/A).

$$P\left(\frac{B}{A}\right) = \frac{P(A \wedge B)}{P(A)}$$

Similarly $P\left(\frac{A}{B}\right) = \frac{P(A \wedge B)}{P(B)}$

31. Independent events:
    Two events A and B of an experiment are said to be independent if occurrence of A does not depend on the occurrence or non occurrence of the event B.
    i.e. A,B are independent if
    $P(A/B) = P(A)$ or $P(B/A) = P(B)$

32. Multiplication Theorem:
    If A and B are any two events in S then
    $P(A \cap B) = P(A)P(B/A)$ if $P(A) \neq 0$.
    $= P(B)P(A/B)$ if $P(B) \neq 0$.

    The events A and B are independent if $P(A \cap B)=P(A) P(B)$
    A set of events $A_1,A_2,A_3,\ldots A_n$ are said to be pair wise independent if
    $P(A_i \cap A_j) = P(A_i)P(A_j)$ for all $i \neq j$

33. Baye's theorem: $E_1, E_2, E_3, \ldots, E_n$ are n mutually exclusive and exhaustive events such that $P(E_i) > 0$ where $(i = 1, 2, \ldots, n)$ in a sample space S and A is any other event in S intersecting with every E_i such that $P(A) \neq 0$ then

$$P\left(\frac{E_k}{A}\right) = \frac{P(E_k)\cdot P\left(\frac{A}{E_k}\right)}{P(E_1)\cdot P\left(\frac{A}{E_1}\right) + P(E_2)\cdot P\left(\frac{A}{E_2}\right) + \ldots + P(E_n)\cdot P\left(\frac{A}{E_n}\right)}$$

have E_k is any one of $E_1, E_2, E_3, \ldots E_n$. If $P(E)$ and $P\left(\frac{A}{E_k}\right)$ are known, the Baye's theorem is evaluated.

34. If A,B are three events then
$P(A\cup B\cup C)= P(A)+P(B)+P(C)-P(A\cap B)-P(A\cap C)-P(B\cap C)+P(A\cap B\cap C)$

Exercise-A

1. The probability of getting a number less than four when a die is rolled is
1)1/2 2) $\frac{1}{4}$ 3)1/3 4)1/6

2. The probability of throwing a number greater than or equal to four when a die is rolled is
1) 1/6 2) $\frac{1}{4}$ 3)1/3 4)1/2

3. If two dice are thrown, the probability of getting an even total on them is
1) 1/36 2) 1/12 3)1/6 4)1/2

4. When three coins are tossed simultaneously the probability of getting one head is
1) 1/8 2) 2/8 3)3/8 4)7/8

5. The probability that vowel selected at random from a English book is a 'u'
1) 5/26 2) 1/5 3)4/5 4)21/26

6. In a single throw with two dice, the probability of throwing a 11 is
1) 1/36 2) 1/18 3)1/16 4)1/11

7. Two dice are thrown simultaneously. The probability that the sum of the numbers on them is at most 5 is
1) 2/18 2) 3/18 3)4/18 4)5/18

8. The probability that a non-leap year should have 52 Mondays is
1) 1/7 2) 2/7 3)5/7 4)6/7

9. A single letter is selected at random from the word 'PROBABILITY'. The probability that it is a vowel is
1) 2/11 2) 3/11 3)4/11 4)7/11

10. Two cards are drawn at random from a pack of 52 cards. The probability that one on them is black and the other is red is
1) 13/51 2) 26/51 3)13/102 4)13/204

11. The letters of the word 'QUESTION' are arranged in a row at random. The probability that the word so formed starts with T and end with N is
1) 2! /8! 2) 6/8! 3)6! /8! 4)7/8!

12. The letter of the word 'SUCCESS' is arranged in a row at random. The probability that all S's come together is
1) 1/7 2) 2/7 3)3/7 4)4/7

13. If the letters of the word MISSISSIPI are arranged in a row at random, the probability that all S's come together is
1) 1/7 2) 1/10 3)1/3 4)1/30

14. If the letter of the word VICTORY are arranged in a row at random, the probability that no two vowels may come together is
1) 3/7 2) 4/7 3)5/7 4)6/7

15. Three mangoes and five apples are placed in a box. If two fruits are chosen at random, the probability that one is a mango and the other is an apple is
1) 3/8 2) 5/8 3)8/28 4)15/28

16. Two horses A and B run a race. If the probability of A's win is twice that of B, then the probability of B's win is
1) 1/5 2) $\frac{1}{4}$ 3)1/3 4)1/30

17. Six boys and four girls sit around a circular table at random. The probability that no two girls sit together is
1) 1/42 2) 5/42 3)3/42 4)2/42

18. If two cards are drawn in succession from a pack of 52 cards, the probability that the two cards are aces is
1) 1/220 2) 1/221 3)1/222 4)1/224

19. If a card is drawn at random from a packet of 100 cards numbered 1 to 100, the probability of drawing a number on the card that is cube is
1) 3/100 2) 4/100 3)9/100 4)10/100

20. If one ticket is drawn at random from a bag containing 20 tickets numbered 1 to 20, the probability that it is a multiple of 5 or 7 is
1) 2/20 2) 6/20 3)7/20 4)12/20

21. Three cards are drawn from a pack of 52 cards. The chance that they are an ace, a king and a queen is
1) 8/5525 2) 16/5525 3)32/5525 4)64/5525

22. Seven persons sit in a row at random. The probability that three persons A, B and C sit together in a particular order is
1) 3! /7! 2) 4! /7! 3)5! /7! 4)3! 5! /7!

23. Seven persons sit in a row at random. The probability that three persons A, B and C sit together is
1) 3! /7! 2) 4! /7! 3)5! /7! 4)3!5! / 7!

24. The probability of drawing 3 white and 4 green balls from a bag containing 5 white and 6 green balls if the seven balls are drawn at random simultaneously is
1) 5/11 2) 6/11 3)7/11 4)8/11

25. Three students A,B and C participate in a singing competition. The probability of A's winning or probability of B's winning is 3times the probability of C's winning. Then the probability of either B or C to win is
1) 2/7 2) 3/7 3)4/7 4)5/7

26. If three coins are tossed, the probability of the event showing exactly one head on them is
1) 1/8 2) 3/8 3)5/8 4)7/8

27. If three dice are thrown, the probability of getting a sum greater than 16 on their faces is
1) 1/36 2) 2/27 3)1/54 4)5/216

28. Three cards are drawn at random from a pack of 52 cards. The probability that they are a king, queen and an even numbered card is
1)1/1105 2)4/1105 3)16/1105 4)64/1105

29. If two unbiased six faced dice are thrown, the probability that the sum of the numbers on both the faces turned up, is a prime number greater than 5 is
1)1/9 2)2/9 3)3/9 4)4/9

30. From a bag containing 4 white balls and 5 black balls. A person draws 3 balls at random. The odds in favour of these 3 balls being black are
1)3:5 2)3:9 3)37:5 4)5:37

31. A and B are mutually exclusive events with P(A) =1/2 P(B). Then P(A)=
1)1/4 2)1/3 3)2/3 4)3/4

32. The odds in favour of drawing a king or a diamond from a well shuffled pack of cards are
1) 9:4 2) 4:9 3)9:5 4)5:9

33. A number is chosen at random among the first 100 natural numbers. The probability that the number chosen being a multiple of 5 or 15 is
1)1/5 2)2/5 3)3/5 4)4/5

34. From 20 tickets marked 1,2,3….., 20 a ticket is drawn at random. The probability that the number on the tickets drawn is a multiple of 2 or 3 is
1)6/20 2)10/20 3)13/20 4)16/20

35. If n dice are rolled, then the total number of exhaustive outcomes are
1)6n 2)6^n 3)n^6 4)6/n

36. From each of three married couples, one partner is selected at random. The probability of the chosen ones being all of the same sex is
1)1/8 2)1/6 3)1/4 4)1/2

37. Ten persons sit round a table. The odds against two specified persons sitting together are
1)2:10 2)10:2 3)7:2 4)2:7

38. In a lottery with 30 tickets numbered 1 to 30, two tickets are drawn simultaneously, the probability that none of the two tickets drawn has a prime number is
1)3/29 2)5/29 3)25/29 4)1/3

39. A and B are two possible events of an n experiment such that P(A)=0.4, P(AUB)=0.7, and P(B)=P. The value of p in order that A and B are mutually exclusive is
1)0.2 2)0.3 3)0.5 4)0.6

40. A and B are two possible events of an of an n experiment such that P(A)=0.3, P(AUB)=0.8, and P(B)=P. The value of p in order that A and B are independent is
1)2/10 2)3/10 3)2/7 4)5/7

41. The probability of a problem being solved by two students A and B are ½ and 1/3. The probability of the problem being solved is
1)1/6 2)1/2 3)2/3 4)5/6

42. If A & B are two events such that P(PUB)=5/6, p(AnB)=1/3 and P(A)=2/3, then A & B are
1).Dependent events 2)Independent events
3).Mutually exclusive events

4)mutually exclusive and independent events

43. Three electric bulbs are to be fitted in a room. Three bulbs are chosen at random from a carton with 10 bulbs having 6 good bulbs. The probability that the room is lighted is
1)3/10 2)6/10 3)1/30 4)29/30

44. A husband and wife appear for an interview for the same post. The probability of husbands' selection is 1/7 and that of wife's selection is 1/5. The probability that both of them get selected is
1)1/35 2)11/35 3)12/35 4)34/35

45. The odds against a certain event are 5 to 2. The odds in favour of another independent event are 6 to 5. Then the probability that at least one of the events to happen is
1)25/77 2)6/77 3)51/77 4)52/77

46. A coin is biased so that the probability of falling head when tossed is ¼. If the coin is tossed 5 times the probability of obtaining 2 heads and 3 tails, with heads occurring is succession is
1)$\frac{5*3^3}{4^5}$ 2)$\frac{3^3}{5^4}$ 3)$\frac{3^3}{4^4}$ 4)$\frac{3^3}{4^5}$

47. Six faces of a die are marked with a numbers 1,-1,0,-2,2,3 and the die is thrown thrice. The probability that the sum of the numbers thrown is six, is
1)3/216 2)6/216 3)10/216 4)18/216

48. A and B are two mutually exclusive events. Then
1) $P(A)\leq P(B)$ 2) $P(A)>=P(B)$ 3) $P(A)<P(B)$ 4)P(AnB)=1

49. A pack of 52 cards is distributed among four people equally. The probability that one of them gets all cards of the same colour is

1)$\frac{C(26,13)}{C(52,13)}$ 2)$\frac{C(4,1)C(52,13)}{C(52,2)}$
3)$\frac{C(2,1)\,C(52,13)}{C(52,2)}$ 4)$\frac{C(2,1)\,C(26,13)}{C(52,13)}$

50. From 6 men and 4 women, a committee of 5 members is to be formed. The probability that this can be done so as to include atleast one woman always is
1.1/42 2.3/42 3.13/42 4.41/42

51. In a throw with a pair of dice, the chance of throwing a doublet is
1)1/36 2)2/36 3)4/36 4)6/36

52. From a pack of 52 cards, one card is drawn at random. After noting it, it is replaced and the pack is well shuffled. Again a card is drawn. Then the probability of getting a spade card in the first draw and other than a king card in the second draw is

1)2/52 2)16/52 3)3/208 4)48/208

53. The odds against A solving a problem are 8 to 6. The odds in favour of b solving the same problem are 14 to 10. If both of them try the problem, the probability that it is solved is

1)1/32 2)31/32 3)5/21 4)16/21

54. If four people are chosen at random, the probability that no two of them were born on the same day of the week is

1)120/343 2)147/343 3)196/343 4)210/243

55. Six boys and six girls sit at random round a table. The probability that the boys and girls alternately is

1)1/462 2)2/462 3)1/460 4)3/460

56. If seven red roses and four white roses of different sizes are strung in the form of garland at random, the probability that no two white roses come together is

1)$\frac{6!\,{}^{7}p_{4}\,2!}{10!}$ 2)$\frac{6!\,{}^{7}P_{4}}{10!}$ 3)$\frac{6!\,{}^{7}P_{4}}{10!2!}$ 4)$\frac{6!\,{}^{6}P_{4}}{10!}$

57. In a bag there are 5 half rupee coins, 4 twenty-five paise coins and 4 ten paise coins. If two coins are drawn from the bag at random, the probability that the amount drawn is to be a minimum is

1)9/13 2)4/13 3)2/13 4)1/13

58. A bag contains 5 red and 3 black balls. Another bag contains 4 red and 5 black balls. If a bag is chosen at random and two balls are drawn from it, the probability that one is red and the other is black is

1)135/504 2)140/504 3)229/504 4)275/504

59. The probability that a student getting a pass in one paper is 75% and the probability of getting a pass in another paper is 60%.The probability that the student pass in one of these two papers only, is

1)6/20 2)9/20 3)11/20 4)13/20

60. The probability that atleast one of the two independent events a A and B will occur is

1)P(A)+P(B) 2)(1-P(A)(1-P(B))
3)P(A)-P(B) 4)1-(1-P(A))(1-P(B))

61. A six faced biased die when thrown shows an even number, twice as compared to an odd number. If the die is thrown twice, the probability that the sum of the two numbers is even is

1)5/9 2)4/9 3)3/9 4)2/9

62. The probability of winning a lottery is 0.15. if four tickets are purchased, the probability for atleast one ticket to win the lottery is

1.0.478 2.0.522 3.0.6 4.0.85

63. There are 20 pairs of shoes in a closet. Four shoes are selected at random. The probability that there is exactly one pair is

1)$\frac{C(20,1)*C(19,1)}{C(40,4)}$ 2)$\frac{C(20,1)*C(38,2)}{C(40,4)}$

3)$\frac{C(20,1)[38,2)-C(19,1)]}{C(40,4)}$ 4)$\frac{C(20,1)C(2,1)}{C(40,4)}$

64. If n students are to be seated at around table, then the probability that two particular students shall be neighbors is

1)$\frac{1}{n-1}$ 2) $\frac{2}{n-1}$ 3)$\frac{1}{(n-1)!}$ 4) $\frac{2}{(n-1)!}$

65. Four boys and four girls are to sit in a row at random. The proximity that all the girls sit together is

1)4!/8! 2)5!/8! 3).4!4!/8! 4)5!4!/8!

66. if 10 sweets are to be distributed among 6 children, the probability that a particular child gets 4 sweets is

1)$C(10,4)/6^{10}$ 2)$C(10,4)*5^6/6^{10}$

3)$C(10,4)+5^6/6^{10}$ 4)$5^6/6^{10}$

67. In a class there are 10 boys and 20 girls. Out of them half the numbers of boys and girls have brown eyes. If a student is chosen at random, the probability that the chosen student is a girl or a brown eyed one is

1)1/3 2)1/2 3)2/3 4)5/6

68. A cricket team of 11 is to be selected out of 15 players, of whom 4 are bowlers. The probability that exactly 3 bowlers are included in the team is

1) C(4,3)/C(15,3) 2)C(11,3)/C(15,3) 3)C(4,3)C(11,8)/C(15,3) 4)0

69. The probability for a student to pass in mathematics is 2/3 and the probability to pass in mathematics and English is 14/45.The probability that he passes (succeeds) in at least one subject is 4/5. The probability that he passes in English is

1)16/45 2) 20/45 3) 30/45 4) 36/45

70. In a class 2/3 are boys and 1/3 are girls. The probability of a boy getting first class is 0.40. If a student is chosen at random, the probability of the chosen student to get first class is
1)2/15 2) 3/15 3) 1/3 4) 2/75

71. A book has 1- 100 pages. If one page is opened at random, the probability that the page opened is a two digit number with same digits is
1) 9/100 2) 90/1000 3) 91/1000 4) 99/100

72. The odds against the sitting of two particular person together, out of n person seated round a circular table is
1)(n-3):2 2) 2: (n-3) 3)(n-2) :2 4) 2:(n-2)

73. In a class there are 60 boys and 20 girls. Half the boys and girls have merit Scholarships. If a student is chosen at random the probability that the student be either a boy or a student with scholarship is
1)1/8 2) 2/8 3) 6/8 4) 7/8

74. The probability of drawing a king, a queen and a jack in that order from a pack of 52 cards in three consecutive draws, the cards drawn already not being placed is
1)1/16575 2) 2/16575 3) 4/16575 4) 8/16575

75. A has 3 tickets of a lottery containing 3 prizes and 9 blanks. B has tow tickets of another lottery containing 2 prizes and 6 blanks. The ratio of their chances of success is
1)32/55: 15/28 2) 32/55:13/28 3) 34/55: 13:28 4) 34/55:15/28

76. If one card is drawn at random from each of two identical sets of 52 playing cards, the probability that atleast one of them is an ace or queen is
1)4/169 2) 3/169 3) 2/169 4) 3/986

77. A number lock contains 4 rings each ring containing 6 numbers. All possible attempts of opening the lock are made but the lock opens in only one way. The probability for the lock to open is
1)4/6! 2) 4!/6! 3) $1/6^4$ 4) $4/6^4$

78. A and B are two events such that P (AUB= 5/6, $P(A \cap B)=1/3$ and P (B) =1/2. Then the events A and B are termed as
1)dependent 2) independent 3) mutually exclusive 4) impossible

79. Two coins care tossed. The probability that two heads result, given that there is atleast one head is
1)1/4 2) 1/3 3) 2/3 4) 3/4

80. Six persons sit in a row. The probability that two particular persons not to be together always is

1)1/6 2) 1/3 3) 2/3 4) 3/4

81. India plays two matches each with New Zealand and Australia. In any match the probabilities for India to win 0, 1 and 2 points are 0.45, 0.05 and 0.5 respectively. If the outcomes are independent, the probability of India getting atleast 7 points is
1)0.857 2) 0.0875 3) 0.0625 4) 0.0250

82. If A and B are tow events such that P(A) >0 and
P(B) ≠ 1, then P(A/B) =
1)1-P(A/B) 2) 1-P(A/B) 3) [1-P(AUB]/ P(B) 4) P(A)/P(B)

83. If three dice are thrown, then the probability that they show the numbers in A.P., is
1)1/36 2) 1/18 3) 2/9 4) 4/9

84. A pair of fair dice is rolled together till a sum of either 5 or 7 is obtained. The proximity that sum of 5 is thrown before 7 is
1)1/5 2) 2/5 3) 3/5 4) 4/5

85. The odds that a book is reviewed favorably by three independent critics are 5 to 2,4 to 3 and 3 to 4 respectively. Then the probability that out of 3 reviews, a majority will be favorable is
1)84/343 2) 105/343 3) 140/343 4) 209/343

86. If P(A) =1/2 , P(B)=1/5, A and B are independent events then P[A/AUB]=
1)1/6 2) 3/2 3)3/4 4) 5/6

87. A determinant is chosen at random from the set of all determinates of order two with elements 0 and 1 only. The probability that the determinant chosen is non zero is
1) 3/16 2)4/16 3) 5/16 4) 6/16

88. The probability of getting 9 cards of the same colour by a person, when a pack of 52 cards are distributed equally among 4 persons is
1)C(139)XC(39,4)/C(52,13) 2) C(13,9) X C(4,1) / C(52,13)
3)C(13,9) X C(9,4) /C(52,4) 4)0

89. A and B be events such that P(A) =0.3, P(B) =0.25 and P(A∩B) = 0.2 then P(A/B) =
1)11/15 2) 12/15 3) 13/15 4) 14/15

90. A five digit number is formed by using the digits 1,2,34 and 5 without repetition. The probability that the number formed is divisible by 4 is
1)1/30 2) 1/20 3) 1/15 4) 1/5

91. In a class 40% students study Mathematics, 25% chemistry and 15% both mathematics and chemistry. If a student is chosen at random from the class, the probability that he studies mathematics, if it is known that he studies chemistry is
1)1/8 2) 3/8 3) 2/5 4) 3/5

92. A bag contains 19 tickets numbered 1 to 10. A ticket is drawn first and later another ticket is drawn without replacement. The probability that both the tickets drawn show even numbers is
1)1/19 2) 2/19 3) 3/19 4) 4/19

93. A young couple has two children. The probability that both children are boys, if this is known that atleast one of the children is a boy is
1)1/4 2) 1/3 3) 1/2 4) 2/3

94. A speaks truth in 80 % cases and B in 70% cases. The probability that they contradict each other in a single event is
1) 0.36 2) 0.38 3) 0.40 4) 0.42

95. There are 3 groups of children comprising 1 boy and 3 girls, 2 boys and 2 girls and 3 boys and 1 girl respectively. A child is selected at random from each group. The probability that the selected component comprise of 2 boys and 1 girls is
1)13/32 2) 16/32 3) 19/32 4)23/32

96. One hundred tickets are numbered as 00, 01,02, …09, 10, 11,….99. If a ticket is drawn at random from then and if A is the event of getting 9 as the sum of the numbers on the tickets then P(A) =
1)9/100 2) 10/100 3) 11/100 4) 12/100

97. If seven squares are chosen at random on a chess board, the probability that they lie on a diagonal line is
1)10(C(64,7) 2) 12/C(64,7) 3) 20/C(64,7) 4) 24/C(64,7)

98. Two squares are chosen at random on a chess board. The probability that they have a side in common is
1)1/18 2) 1/12 3) 1/9 4) 1/7

99. $P(A\cap B) = \frac{1}{4}$, $P(A\cup B) = 4/5$ and $P(A) = P(B)=p$. then P=
1)19/40 2) 20/40 3) 21/40 4) 22/40

100. If P(E) =0.3 , P(F) =0.2 and P(EUF)=0.4, then $P(E\cap F)=$
1)0.1 2) 0.2 3) 1.2 4) 1.4

101. The probability that atleast one of the events A,B occur is 0.6 and the events A and B occur simultaneously with probability 0.2, then P(A)+P(B) is
1)0.4 2) 0.8 3) 1.2 4) 1.4

102. A bag contains 3 white 3 black and 2 red balls. Three balls are drawn one after another without replacement. The probability that the third ball drawn is red is
1)1/28 2) 3/28 3)5/28 4)1

103. Three persons A,B,C have to speak along with 5 others at a function. If a person is chosen to speak at random, the probability that A speaks before B and C speaks before A in that order is
1)1/5 2)1/6 3)3/5 4)3/8

104. Five persons A,B,C,D,E are contesting an election in which 3 persons are to be elected. If C is elected unanimously, the probability that D gets elected is
1)1/18 2) 1/6 3) 1/3 4) 1/2

105. Three persons A,B,C in order toss a die. The person who first throws 5 to 6 wins. The probability of their winning in order, is
1)4/19, 6/19, 9/19 2) 9/19, 4/19, 6/19
3) 9/19, 6/19, 4/19 4) 9/19,5/19,5/19

106. There are 2 bags A and B. A contains 3 black and 4 white balls. B contains 4 black and 3 white balls. A die is cast . If the face 1 or 3 turn up, a ball is chosen from A. If any other face turns up, a ball is chosen from B. The probability of choosing a black ball is
1)8/21 2) 9/21 3) 10/21 4) 11/21

107. Bag A contains 4 black and 6 red balls. Bag B contain 7 black and 5 red balls. A die is rolled. If one or two turns up, bag A is chosen, otherwise bag B is chosen. If one ball is drawn from the selected bag. The probability that it red is
1) 24/90 2) 35/90 3) 43/90 4) 58/90

108. Bag A contains 3 white and 2 black balls. Bag B contains 2 white and 4 black balls. If a bag is chosen at random, and a ball is drawn from it, the probability that it is white is
1) 3/15 2) 7/15 3) 8/15 4) 14/15

109. The probability that an event A happens in one trial of an experiment is 0.4. three independent trials of the experiment are performed. The probability that the event a happens atleast once is
1) 0.784 2) 0.904 4) 0.916 4) 0.936

110. A speaks truth in 80% cases and B speaks truth in 60% cases. The percentage of the cases in which A and B are likely to contradict each other in stating the same fact is
1)40% 2)44% 3) 480% 4) 52%

111. A coin is tossed n times. The probability that the head will present itself an odd number of times is

1) $(1/2)^n$ 2) $(1/2)^{n+1}$ 3) $(1/2)^{2n+1}$ 4) $2^{n-1}/2^n$

112. A and B throw a pair of dice. A wins if he throws 6 before B throws 7 and B wins if he throws 7 before A throws 6. if A begins, his chance of winning is
1)5/61 2) 30/61 3) 35/61 4) 60/61

113. A and B seek admission in I.I.T. The probability that A is selected is 0.5 and the probability that both A and B are selected is atmost 0.3. The probability of B getting selected is atmost.
1)0.5 2) 0.6 3) 0.7 4) 0.8

114. An ordinary cube has four blank faces, one face marked two and another three. The probability of obtaining a total of exactly 12 is 5 throws is
1)$5/6^4$ 2) $10/6^5$ 3) $15/6^5$ 4) $50/6^5$

115. Fifteen coupons are numbered 1,2,…. 15 respectively. Seven coupons are selected at random, one at a time with replacement. The probability that the largest number appearing on a selected coupon 9 is
1)$(6/15)^7$ 2) $(7/15)^7$ 3) $(8/15)^7$ 4)1

116. There are 4 letters and 4 addressed envelopes. If the letters are inserted at random in the envelopes, the chance that atleast one letter may be placed in wrongly addressed envelope is
1)1/24 2) 3/24 3) 23/24 4) 1/6

117. The probability that in a family of 4 children there will be at least one boy is
1) $\frac{1}{16}$ 2) $\frac{3}{16}$ 3) $\frac{5}{16}$ 4) $\frac{15}{16}$

118. Three dice are rolled simultaneously. The probability that the sum of the numbers on them is 6 is
1) $\frac{1}{36}$ 2) $\frac{5}{108}$ 3) $\frac{26}{51}$ 4) $\frac{13}{34}$

119. Three dice are rolled thrice. The probability of getting triplet is
1) $\frac{1}{36}$ 2) $\frac{5}{108}$ 3) $\frac{26}{51}$ 4) $\frac{13}{34}$

120. When a card is drawn from a pack, the probability of getting king is
1) $\frac{1}{13}$ 2) $\frac{1}{4}$ 3) $\frac{9}{13}$ 4) $\frac{1}{2}$

121 When a card is drawn from a pack, the probability of getting heart is
1) $\frac{1}{13}$ 2) $\frac{1}{4}$ 3) $\frac{9}{13}$ 4) $\frac{1}{2}$

122. When a card is drawn from a pack, the probability of getting number card is

1) $\frac{1}{13}$ 2) $\frac{1}{4}$ 3) $\frac{9}{13}$ 4) $\frac{1}{2}$

123. Two cards are drawn from a pack. The probability of getting two aces is

1) $\frac{1}{4}$ 2) $\frac{1}{13}$ 3) $\frac{1}{221}$ 4) $\frac{1}{17}$

124 A bag contains 2 white, 3 red, 4 black balls. 2 balls are drawn at random. Match the following.

I. probability of getting 2 white balls is a)1/36
II.Probability of getting 2 red balls is b)1/12
III. Probabililty of getting 2 black balls is c)1/6
1)a,b,c 2)b,c,a 3)c,a,b 4)b,a,c

125. A,B,C are 3 mutually exclusive and exhaustive events in a trail. Match the following.

I. If P(A)=2P(B)=3P(C) then P(A)= a)15/23
II. If P(A)=2P(B)=2P(C) then P(A)= b)3/5
III. If P(A)=3P(B)=5P(C) then P(A)= c)1/2
1)a,b,c2) 2)b,c,a 3)c,a,b 4)b,a,c

PREVIOUS EAMCET PROBLEMS

126. The probability that a leap year will have exactly 52 Tuesday is
1)1/7 2)3/7 3)2/7 4)5/7 (1985)

127. The probability of getting a number between 1 and 100 which is divisible by one and itself only is (1987)
1)27/185 2)23/97 3)25/98 4)2

128. The probability that a leap year have 53 Sundays is (1987)
1)1/7 2)2/7 3)5/7 4)6/7

129. A card is drawn at random from a normal pack or cards. The probability that it is either a spade or a queen is (1987)
1)1/13 2)4/13 3)1/4 4)13/4

130. If A and B are two events such that P(AUB)=0.65, P(a B)=0.15 then P(A) + P(B)=
1)0.6 2)0.8 3)1.2 4)1.4 (1988)

131. The probability of getting at least two heads when tossing a coin three times is
1)1/8 2)3/8 3)1/2 4)5/8 (1988)

132. Card is drawn at random from a pocket of 100 cards numbered 1 to100. The probability of drawing a number which is a square is (1989)
1)1/100 2)2/1200 3)1/10 4)3/10

133. Three balls are drawn at random from a collection of 7 white, 12 green and 4 red balls. The probability that each is of different color is (1989)
1)48/253 2)64/253 3)23/253 4)56/253

134. A card is taken out of a pack of 52 cards numbered 2 to 53. The probability that the number on the card is a prime number lessthan20 is (1990)
1)1/13 2)2/13 3)3/13 4)4/13

135. Three mangos and three apples are in a box. If two fruits are chosen at random the probability that one is mango and the other is an apple is (1991)
1)3/5 2)5/6 3)1/36 4)2/7

136. When two balls are drawn from a bag containing 2 white, 4 red and 6 black balls, the chance for both of them to be red is (1991)
1)1/11 2)6/11 3)3/11 4)4/12

137. Two dice are thrown simultaneously. The probability of getting even numbers on both the dice is
1)1/3 2)1/4 3)1/6 4)1/12 (1991)

138. When two dice are thrown, the probability of getting equal numbers is (1991)
1)1/6 2)1/12 3)1/18 4)5/36

139. In a class of 125 students, 70 passed in Mathematics, 55 in Statistics and 30 in both. The probability that a student selected at random from the class, has passed in only one subject.
1)13/25 2)3/25 3)17/25 4)8/25 (1993)

140. The probability of getting a total of 10 in a single throw of two dice is
1)1/9 2)1/12 3)1/6 4)5/36 (1994)

141. If A and B are two events such that p(A) = 1/4, P(B) =1/2, P(AUB) = 5/8 then P(A∩B)=
1)3/8 2)1/8 3)2/8 4)5/8 (1995)

142. If two dice are rolled then the probability that their sum is a prim number is
1)5/12 2)5/6 3)5/36 4)2/5 (1996)

143. When two dice are thrown, the probability of getting the sum 10 or11is
1)7/36 2)5/36 3)5/18 4)7/18 (1996)

144. The probability of getting exactly 2 tails in 6 tosses of a fair coin is (1996)

1)3/8 2)1/4 3)15/64 4)49/64

145. Six coins are tossed simultaneously. The probability of getting at least 4 heads is
1)11/64 2)11/32 3)15/44 4)21/32 (1996)

146. A problem in EAMCET examination is given to 3 students A,B and C whose chances of solving it are 1/2,1/3 and 1/4 respectively. The probability that the problem will be solved is
1)3/4 2)1/24 3)1/4 4)23/24 (1998)

147. A single letter is selected at random from the word PROBABILITY. The that it is a vowel is
1)1/11 2)4/11 3)2/11 4)1/11 (1999)

148. The probability of getting a total score of 7 when two unbiased dice are thrown Simultaneously is
1)7/36 2)29/36 3)1/6 4)5/6 (1999)

149. In a competition A, B and C are participating. The probability that A wins twice that of B, the probability that B wins is twice that of C. Then the probability that A loses is
1)1/7 2)2/7 3)4/7 4)3/7 (2001)

150. The probability that a number selected at random from the set of numbers {1,2,3,….100} is a cube is
1)1/25 2)2/25 3)3/25 4)4/25 (2001)

151. The probability of choosing at random a number divisible by 6 or 8 from among 1 to 90 is 1)1/6 2)11/90 3)1/30 4)23/90 (2001)

152. If S is a sample space, P(A)=1/3P(B) and S=AUB, where A,B are two mutually exclusive events, then P(A)= (2001)
1)1/4 2)1/2 3)3/4 4)3/8

153. An unbiased coin is tossed to get 2 points for turning up a head and one point for the tail. If three unbiased coins are tossed simultaneously, then the probability of getting a total of odd number of points is (2004)
1)1/2 2)1/4 3)1/8 4)3/8

154. Suppose E and F are two events of a random experiment. If the probability of occurrence of E is 1/5 and the probability of occurrence of F given E is 1/10, then the probability of non- occurrence of at least one of the events E and F is
1)1/18 2)1/2 3)49/50 4)1/50 (2004)

155. Six faces of an unbiased die are numbered with 2, 3, 5, 7, 11 and 13. If two such dice are thrown, then the probability that the sum on the uppermost faces of the dice is an odd number is
1)5/18 2)5/36 3)13/18 413/18 (2004)

156. Box A contains 2 black and 3 red balls, while Box B contains 3 black and 4 red balls. Out of these two boxes one is selected at random; and the probability of choosing Box A is double that of Box B. If a red ball is drawn from the selected box then the probability that it has come from Box B is :
1)21/41 2)10/31 3)12/31 4)13/41 (2005)

157. A number n is chosen at random from S={1,2,3….50} . Let A={n∈S: n+50>27}, B={n∈S: n is a prime} and C={n∈S; n is a square}. Then correct order of their probabilities
1)P(A)<P(B)<P(C) 2)P(A)>P(B)>P(C)
3)P(B)<P(A)<P(C) 4)P(A)>P(C)>P(B)

158. A coin and six faced die, both unbiased, are thrown simultaneously. The probability of getting a head on the coin and an odd number on the die is: (2005)
1)1/2 2)3/4 3)1/4 4)2/3

159. If A and B are two independent events such that p(B)=2/7, p(AUB)=0.8, then P(A)= (2006)
1)0.1 2)0.2 3)0.3 4)0.4

160. A number n is chosen at random from {1,2,3,4,….1000}. The probability that n is a number that leaves remainder 1 when divided by 7 is
1)71/500 2)143/1000 3)72/500 4)71/1000 (2006)

161. In the random experiment of tossing two unbiased dice let E be the event of getting the sum 8 and F be the event of getting even numbers on both dice. Then:
I. P(E)=7/36 II. P(F)=1/3
Which of the following is a correct statement? (2006)
1)Both I and II are true 2)Neither I nor II is true
3)I is true, II is false 4)I is false, II is true

162. Seven balls are drawn simultaneously from a bag containing 5 white and 6 green balls. The probability of drawing 3 white and 4 green balls is (2006)
1) $\frac{7}{{}^{11}C_7}$ 2) $\frac{{}^5C_3 + {}^6C_4}{{}^{11}C_7}$ 3) $\frac{{}^5C_2 + {}^6C_2}{{}^{11}C_7}$ 4) $\frac{{}^6C_3\,{}^5C_4}{{}^{11}C_7}$

163. Four numbers are choosen at random from {1,2,3,….,40}. The probability that they are not consecutive is (2007)
1) $\frac{1}{2470}$ 2) $\frac{4}{7969}$ 3) $\frac{2469}{2470}$ 4) $\frac{7965}{7969}$

164. If A and B are two mutually exclusive events with P(B) ≠ 1, then $P(A|B) = X$ (Here B is a complement if the event B). (2007)
1) $\frac{1}{P(B)}$ 2) $\frac{1}{1-P(B)}$ 3) $\frac{P(A)}{P(B)}$ 4) $\frac{P(A)}{1-P(B)}$

165. A bag contains 6 white and 4 black balls. Two balls are drawn at random.The probability that they are of the same colour is (2007)

1)1/15 2)2/5 3)4/15 4)7/15

166. If A and B are independent events of a random experiment such that $P(A \wedge B) = \frac{1}{6}$

$P(\bar{A} \wedge \bar{B}) = \frac{1}{3}$ then P(A)= (2008)

1) $\frac{1}{4}$ 2) $\frac{1}{3}, \frac{1}{2}$ 3)0 4) $\frac{2}{3}$

167. For k=1,2,3 the box B_k contains k red balls and k+1 white balls. Let $P(B_1)=1/2$ $P(B_2)=1/3$ and $P(B_3)=1/6$.A box is selected at random and a ball is drawn from it.If a red ball is draw then the probability that it has come from box B_2 is (2008)

1)35/78 2)14/39 3)10/13 4)12/13

168. Let S be the sample space of the random experiment of throwing simultaneously two unbiased dice with 6 faces (numbered 1 to 6) and let $E_k=\{(a,b) \in S : ab = k\}$ for $k \geq 1$ then the correct among the following is (2008)

1) $p_1 \langle p_{30} \langle p_4 \langle p_6$ 2) $p_{36} \langle p_6 \langle p_2 \langle p_4$ 3) $p_1 \langle p_{11} \langle p_4 \langle p_6$ 4) $p_{36} \langle p_{11} \langle p_6 \langle p_4$

169. If A and B are events of a random experiment such that $P(A \cup B) = \frac{4}{5}$, $P(\overline{A} \cup \overline{B}) = \frac{7}{10}$ and $P(B) = \frac{2}{5}$, then P(A) = (2009)

1) $\frac{9}{10}$ 2) $\frac{8}{10}$ 3) $\frac{7}{10}$ 4) $\frac{3}{5}$

170. The probability of choosing randomly a number c from the set {1, 2, 3, …,9} such that the quadratic equation $x^2+4x+c=0$ has real roots is: (2009)

1) $\frac{1}{9}$ 2) $\frac{2}{9}$ 3) $\frac{3}{9}$ 4) $\frac{4}{9}$

171. Suppose that E_1 and E_2 two events of a random experiment such that $P(E_1) = \frac{1}{4}$, $P(E_2/E_1) = \frac{1}{2}$ and $P(E_1/E_2) = \frac{1}{4}$. Observe the lists given below: (2009)

List–I	List–II
A. $P(E_2)$	i. ¼
B. $P(E_1 \cup E_2)$	ii. 5/8
C. $P(\overline{E_1} / \overline{E_2})$	iii. 1/8
	iv. 1/2
	v. 3/8
	vi. ¾
	vii.

The correct matching of the List–I from the List–II is:

	A	B	C	D
1)	(ii)	(iii)	(vi)	(i)
2)	(iv)	(v)	(vi)	(i)
3)	(iv)	(ii)	(vi)	(i)
4)	(i)	(ii)	(iii)	(iv)

172. An urn A contains 3 white and 5 black balls. Another urn B contains 6 white and 8 black balls. A ball is picked from A at random and then transferred to B. Then a ball is picked at random from B. The probability that it is a white ball is : (2010)

1) $\frac{14}{40}$ 2) $\frac{15}{40}$ 3) $\frac{16}{40}$ 4) $\frac{17}{40}$

173. If A_i=(I = 1, 2, 3, ……., n) are n independent events with $P(A_i)\frac{1}{1+i}$ for each i, then the probability that none of A_i occurs is : (2010)

1) $\frac{n-1}{n+1}$ 2) $\frac{n}{n+1}$ 3) $\frac{n}{n+2}$ 4) $\frac{1}{n+1}$

174. Suppose A and B are two events that $P(A \cap B) = 3/25$ and $P(B - A) = 8/25$. Then P(B) = (2010)

1) $\frac{11}{25}$ 2) $\frac{3}{11}$ 3) $\frac{1}{11}$ 4) $\frac{9}{11}$

175. A class has fifteen boys and five girls. Suppose three students are selected at random from the class. The probability that there are two boys and one girl is [2011]

1) $\frac{35}{76}$ 2) $\frac{35}{38}$ 3) $\frac{7}{76}$ 4) $\frac{35}{72}$

176. Seven white and three black balls are randomly arranged in a row. The probability that no two black balls are placed adjacently is [2011]

1) $\frac{1}{2}$ 2) $\frac{7}{15}$ 3) $\frac{2}{15}$ 4) $\frac{1}{3}$

177. Let A and B be events in a sample space S such that $P(A) = 0.5, P(B) = 0.4$ and $P(A \cup B) = 0.6$. Observe the following lists: [2011]

List I	List II
i) $P(A \cap B)$	a) 0.4
ii) $P(A \cap B)$	b) 0.2
iii) $P(\overline{A} \cap B)$	c) 0.3
iv) $P(\overline{A} \cap B)$	d) 0.1

	i	ii	iii	iv		i	ii	iii	iv
1)	a	b	c	d	2)	c	b	d	a
3)	c	b	a	d	4)	c	a	b	d

178. A fair coin is tossed 100 times.The probability of getting tails an odd number of times is [2012]

1) $\frac{1}{2}$ 2) $\frac{1}{4}$ 3) $\frac{1}{8}$ 4) $\frac{3}{8}$

179. There are four machines & it is known that exactly two of them are faculty. They are tested one by one, in a random order till both the faulty machines are identified. Then the probability that only two tests are needed is [2012]

1) $\frac{1}{3}$ 2) $\frac{1}{6}$ 3) $\frac{1}{2}$ 4) $\frac{1}{4}$

180. In an entrance test there are multiple choice questions. There are four possible answers to each question, of which one is correct. The probability that a student knows the answer to a question is 9/10. If he gets the correct answer to a question, then the probability that it was getting is [2012]

1) $\frac{37}{40}$ 2) $\frac{1}{37}$ 3) $\frac{36}{37}$ 4) $\frac{1}{9}$

181. Two numbers are chosen at random from {1, 2, 3, 4, 5, 6, 7, 8} at a time. The probability that smaller of the two numbers is less than 4 is [2013]

1) $\frac{7}{14}$ 2) $\frac{8}{14}$ 3) $\frac{9}{14}$ 4) $\frac{10}{14}$

182. Two fair dice are rolled. The probability of the sum of digits on their faces to be greater than or equal to 10 is [2013]

1) $\frac{1}{5}$ 2) $\frac{1}{4}$ 3) $\frac{1}{8}$ 4) $\frac{1}{6}$

183. A bag contains 2n + 1 coins. It is known that n of these coins have a head on both sides, whereas the remaining n + 1 coins are fair. A coin is picked up at random from the bag & tossed. If the probability that the toss results in a head is $\frac{31}{42}$ then n = [2013]

1) 10 2) 11 3) 12 4) 13

184. If A, B & C are mutually exclusive & exhaustive events of a random experiment such that $P(B)=\frac{3}{2}P(A)$ & $P(C)=\frac{1}{2}P(B)$ then $P(A\cup C)=$ (2014)

1) $\frac{3}{13}$ 2) $\frac{6}{13}$ 3) $\frac{7}{13}$ 4) $\frac{10}{13}$

185. A six-faced unbiased die is thrown twice & the sum of the numbers appearing on the upper face is observed to be 7. The probability that the number 3 has appeared at least once is (2014)

1) $\frac{1}{2}$ 2) $\frac{1}{3}$ 3) $\frac{1}{4}$ 4) $\frac{1}{5}$

186. A candidate takes three tests in succession & the probability of passing the first test is p. The probability of passing each succeeding test is p or $\frac{p}{2}$ according as he passes or fails in the preceeding one. The candidate is selected if he passes at least two tests. The probability that the candidate is selected is (2014)

1) $p(2-p)$ 2) $p + p^2 + p^3$ 3) $p^2(1-p)$ 4) $p^2(2-p)$

187. If A & B are events such that $P(A \cup B) = \frac{5}{6}, P(\overline{A}) = \frac{1}{4}, P(B) = \frac{1}{3}$ Then A & B are (2015)

1) mutually exclusive 2) independent
3) exhaustive events 4) exhaustive & independent

188. If A & B are two events such that $P(\overline{A} \mid B) = 0.6$ $P(B \mid A) = 0.3$ $P(A) = 0.1$ then $P(\overline{A} \cap \overline{B}) =$ (Here $\overline{E}$ is the complement of the event E) (2015)

1) 0.88 2) 0.12 3) 0.6 4) 0.4

189. In a certain college 4% of the men & 1% of the women are taller than 1.8 meters. Also 60% of the students are women. If the student selected at random is found to be taller than 1.8 meters, then the probability that the students being a woman is (2015)

1) $\frac{3}{11}$ 2) $\frac{5}{11}$ 3) $\frac{6}{11}$ 4) $\frac{8}{11}$

190. Two persons A & B are throwing an unbiased six faced die alternatively, with the condition that the person who throws 3 first wins the game. If A starts the game, the probabilities of A & B to win the same are respectively (2015 A.P)

1)6 / 11, 5 / 11 2) 5 / 11, 6 / 11 3) 8 / 11, 3 / 11 4) 3 / 11, 8 / 11

191. The letters of the word "QUESTION" are arranged in a row at random. The probability that there are exactly two letters between Q & S is (2015 A.P)

1) 1/14 2) 5 / 7 3) 1 / 7 4) 5 / 28

192. If $\frac{1+3p}{3}, \frac{1-2p}{2}$ are probabilities of two manually exclusive events, the p lies in the interval (2015 A.P)

1) [-1/3, 1/2] 2) (-1/2, 1/2) 3) [-1/3, 2/3] 4) (-1/3, 2/3)

193. The probability that an event does not happen in one trial is 0.8. The probability that the event happen at most once in three trials is (2015 A.P)

1) 0.896 2) 0.791 3) 0.642 4) 0.592

194. Two events A & B are such that $P(A)=\frac{1}{4}, P(A/B)=\frac{1}{4}$ & $P(B/A)=\frac{1}{2}$ Consider the following statements: (2016)

I) $P(\overline{A}/B)=\frac{3}{4}$ II) A & B are mutually exclusive

III) $P(A/B)+P(A/\overline{B})=1$

Then

1) Only (I) is correct 2) Only (I) & (II) are correct

3) Only (I) & (III) are correct 4) Only (II) & (III) are correct

195. A five digit number is formed by the digits 1, 2, 3, 4, 5 with no digit being repeated. The probability that the number is divisible by 4 is (2016)

1) $\frac{1}{5}$ 2) $\frac{2}{5}$ 3) $\frac{3}{5}$ 4) $\frac{4}{5}$

196. When a pair of six faced fair dice are thrown, the probability that the sum of the numbers on the two dice is greater than 7 is (2016)

1) $\frac{1}{3}$ 2) $\frac{5}{12}$ 3) $\frac{1}{2}$ 4) $\frac{1}{4}$

197. In a family with 4 children, the probability that there are at least two girls is (2016)

1) $\frac{1}{2}$ 2) $\frac{9}{16}$ 3) $\frac{3}{4}$ 4) $\frac{11}{16}$

198. 3 out of 6 vertices of a regular hexagon are chosen at a time at random. The probability that the triangle formed with these three vertices is an equilateral triangle is (2016AP)

1) $\frac{1}{2}$ 2) $\frac{1}{5}$ 3) $\frac{1}{10}$ 4) $\frac{1}{20}$

199. A speaks truth in 75% of the cases & B in 80% of the cases. Then the probability that their statements about an incident do not match is (2016AP)

1) $\frac{7}{20}$ 2) $\frac{3}{20}$ 3) $\frac{2}{7}$ 4) $\frac{5}{7}$

200. If the mean & variance of a binomial distribution are 4 & 2 respectively, then the probability of 2 successes of that binomial variate X is (2016AP)

1) $\frac{1}{2}$ 2) $\frac{219}{256}$ 3) $\frac{37}{256}$ 4) $\frac{7}{64}$

201. An integer is choosen from $\{2k / -9 \le k \le 10\}$. The probability that it is divisible by both 4 & 6 is (2017)

1) $\frac{1}{10}$ 2) $\frac{1}{20}$ 3) $\frac{1}{4}$ 4) $\frac{3}{20}$

202. If A & B are events having probabilities, P(A) = 0.6, P(B) = 0.4 & $P(A \cap B) = 0$, then the probability that neither A nor B occurs is (2017)

1) $\frac{1}{4}$ 2) 1 3) $\frac{1}{2}$ 4) 0

203. Three faces of a far die are yellow, two faces are red & one face is blue. If the die is tossed 3 times, then the probability that the colours yellow, red & blue appear is (need not be in that order) (2017AP)

1) $\frac{1}{36}$ 2) $\frac{1}{6}$ 3) $\frac{5}{6}$ 4) $\frac{1}{2}$

204. A college student has to appear for two examinations A & B. The probabilities that the student passes in A & B are $\frac{2}{3}$ & $\frac{3}{4}$ respectively. If it is known that the student passes at least one among the two examinations, then the probability that the student will pass both the examination is (2017AP)

1) 1/6 2) 1/2 3) 1/3 4) 6/11

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1) 1	2) 4	3) 4	4) 3	5) 2	6) 2	7) 4	8) 4	9) 2	10) 2
11) 3	12) 1	13) 4	14) 3	15) 4	16) 3	17) 2	18) 2	19) 2	20) 2
21) 2	22) 3	23) 4	24) 1	25) 3	26) 2	27) 3	28) 3	29) 4	30) 2
31) 2	32) 2	33) 4	34) 3	35) 2	36) 3	37) 3	38) 4	39) 2	40) 4
41) 3	42) 2	43) 4	44) 1	45) 4	46) 3	47) 3	48) 1	49) 4	50) 4
51) 4	52) 4	53) 4	54) 1	55) 1	56) 2	57) 4	58) 4	59) 2	60) 4
61) 4	62) 4	63) 2	64) 3	65) 1	66) 2	67) 4	68) 4	69) 2	70) 3
71) 1	72) 1	73) 4	74) 4	75) 3	76) 4	77) 3	78) 2	79) 2	80) 3
81) 2	82) 3	83) 4	84) 2	85) 4	86) 4	87) 4	88) 4	89) 3	90) 4
91) 4	92) 4	93) 2	94) 2	95) 1	96) 2	97) 1	98) 1	99) 1	100) 1
101) 3	102) 4	103) 1	104) 4	105) 3	106) 4	107) 3	108) 2	109) 1	110) 2
111) 4	112) 2	113) 4	114) 1	115) 4	116) 3	117) 4	118) 4	119) 2	120) 1
121) 2	122) 3	123) 3	124) 1	125) 2	126) 4	127) 3	128) 2	129) 2	130) 3
131) 3	132) 3	133) 1	134) 2	135) 1	136) 1	137) 2	138) 1	139) 1	140) 2
141) 2	142) 1	143) 2	144) 3	145) 2	146) 1	147) 2	148) 3	149) 4	150) 1
151) 4	152) 1	153) 1	154) 3	155) 1	156) 3	157) 2	158) 3	159) 3	160) 2
161) 3	162) 3	163) 3	164) 4	165) 4	166) 2	167) 2	168) 1	169) 3	170) 4
171) 3	172) 4	173) 4	174) 1	175) 1	176) 2	177) 2	178) 1	179) 2	180) 2
181) 3	182) 4	183) 2	184) 3	185) 2	186) 4	187) 2	188) 1	189) 1	190) 1
191) 4	192) 1	193) 1	194)	195) 1	196) 2	197) 4	198) 3	199) 1	200) 4
201) 4	202) 4	203) 2	204) 4	205)	206)	207)	208)	209)	210)

Exercise-B

1. The probability that a leap year will have exactly 52 Tuesday is
   1)1/7 2)3/7 3)2/7 4)5/7

2. The probability of getting a number between 1 and 100 which is divisible by one and itself only is
   1)27/185 2)23/97 3)25/98 4)none

3. The probability that a leap year have 53 Sundays is
   1)1/7 2)2/7 3)5/7 4)6/7

4. A card is drawn at random from a normal pack or cards. The probability that it is either a spade or a queen is
   1)1/13 2)4/13 3)1/4 4)13/51

5. If A and B are two events such that P(AUB)=0.65, $P(A \cap B)$=0.15 then P(A)+P(B)=
   1) 0.6 2)0.8 3)1.2 4)1.4

6. The probability of getting at least two heads when tossing a coin three times is
   1)1/8 2)3/8 3)1/2 4)5/8

7. Card is drawn at random from a pocket of 100 cards numbered 1 to100. The probability of drawing a number which is a square is
1)1/100 2)2/1200 3)1/10 4)3/10

8. Three balls are drawn at random from a collection of 7 white, 12 green and 4 red balls. The probability that each is of different color is
1)48/253 2)64/253 3)23/253 4)56/253

9. A card is taken out of a pack of 52 cards numbered 2 to 53. The probability that the number on the card is a prime number lessthan20 is
1)1/13 2)2/13 3)3/13 4)4/13

10. Three mangoes and three apples are in a box. If two fruits are chosen at random the probability that one is mango and the other is an apple is
1)3/5 2)5/6 3)1/36 4)1/2

11. When two balls are drawn from a bag containing 2 white, 4 red and 6 black balls, the chance for both of them to be red is
1)1/11 2)6/11 3)3/11 4)4/12

12. Two dice are thrown simultaneously. The probability of getting even numbers on both the dice is
1)1/3 2)1/4 3)1/6 4)1/12

13. When two dice are thrown, the probability of getting equal numbers is
1)1/6 2)1/12 3)1/18 4)5/36

14. In a class of 125 students, 70 passed in Mathematics, 55 in Statistics and 30 in both. The probability that a student selected at random from the class, has passed in only one subject.
1)13/25 2)3/25 3)17/25 4)8/25

15. The probability of getting a total of 10 in a single throw of two dice is
1)1/9 2)1/12 3)1/6 4)5/36

16. If A and B are two events such that p(A)=1/4,P(B)=1/2,P(AUB)=5/8 then $P(A\cap B)=$
1)3/8 2)1/8 3)2/8 4)5/8

17. If two dice are rolled then the probability that their sum is a prim number is
1)5/12 2)5/6 3)5/36 4)2/5

18. When two dice are thrown, the probability of getting the sum 10 or11is
1)7/36 2)5/36 3)5/18 4)7/18

19. The probability of getting exactly 2 tails in 6 tosses of a fair coin is
1)3/8 2)1/4 3)15/64 4)49/64

20. Six coins are tossed simultaneously. The probability of getting at least 4 heads is
1)11/64 2)11/32 3)15/44 4)21/32

21. A problem in EAMCET examination is given to 3 students A,B and C whose chances of solving it are 1/2,1/3 and 1/4 respectively. The probability that the problem will be solved is
1)3/4 2)1/24 3)1/4 4)23/24

22. A single letter is selected at random from the word PROBABILITY. The that it is a vowel is
1)1./11 2)4/11 3)2/11 4)1/11

23. The probability of getting a total score of 7 when two unbiased dice are thrown imultaneously is
1)7/36 2)29/36 3)1/6 4)5/6

24. In a competition A, B and C are participating. The probability that A wins twice that of B, the probability that B wins is twice that of C. Then the probability that A loses is
1)1/7 2)2/7 3)4/7 4)3/7

25. The probability that a number selected at random from the set of numbers {1,2,3,….100} is a cube is
1)1/25 2)2/25 3)3/25 4)4/25

26. The probability of choosing at random a number divisible by 6 or 8 from among 1 to 90 is
1)1/6 2)11/90 3)1/30 4)23/90

27. An unbiased coin is tossed to get 2 points for turning up a head and one point for the tail. If three unbiased coins are tossed simultaneously, then the probability of getting a total of odd number of points is
1)1/2 2)1/4 3)1/8 4)3/8

28. Suppose E and F are two events of a random experiment. If the probability of occurrence of E is 1/5 and the probability of occurrence of F given E is 1/10, then the probability of non-occurrence of at least one of the events E and F is
1)1/18 2)1/2 3)49/50 4)1/50

29. Six faces of an unbiased die are numbered with 2, 3, 5, 7, 11 and 13. If two such dice are thrown, then the probability that the sum on the uppermost faces of the dice is an odd number is
1)5/18 2)5/36 3)13/18 413/18

KEYS

1) 4	2) 3	3) 2	4) 2	5) 3	6) 3	7) 3	8) 1	9) 2	10) 1
11) 1	12) 2	13) 1	14) 1	15) 2	16) 2	17) 1	18) 2	19) 3	20) 2
21) 1	22) 2	23) 3	24) 4	25) 1	26) 4	27) 1	28) 3	29) 1	

10. RANDOM VARIABLE

1. Random variable: let S be the sample space of a given random experiment. A real valued function $X : S \to R$ is called a random variable.

2. A sample space S is said to be discrete if it is countable or S having finite number of sample points.

3. If the number of sample points is a sample space is not finite then it is called as continuous sample space.

4. Let the countable set E= $\{x_1, x_2, \ldots x_n\}$ be the range of a discrete random variable 'x' for i= 1,2,3 .. we know $P(x=x_i)$
   The series is called the mean of the random variable and is denoted by μ or x.

5. The series $\Sigma\ (x_i - \mu)^2\ P(X=x_i)$ is called the variance of the random variable 'x' this is denoted by T2 . the non – negative value of the square root is called the standard deviation (S.D)

6. Variance $T^2 = \Sigma x_i^2 P(x= x_i) - \mu^2$

7. A box contains 'a' white and 'b' black balls 'c' balls are drawn at random .each ball drawn is replaced before the next drawn.
   i) the expected number of white balls drawn is c= a/(a+b)
   ii) The expected number of black balls drawn is c= b/(a+b)

8. A coin is tossed 'n' items, then
   a) the mean value of the number of heads = n/2
   b) the variance of the number of heads = n/4
   c) the S.D. of the number of heads = √n/2

9. Two dice are rolled and the probability distribution of the sum of the numbers on them is formed then the mean of the random variable is 7/2

10. For binomial variate *X*, means = $\bar{x} = np$, varience = $\sigma^2 = npq$ standard deviation $\sigma = \sqrt{\text{varience}} = \sqrt{npq}$.

11. Poisson's distribution may be derived as a limiting case of binomial distribution under the following conditions.
    i) Number of trials must be large *i.e.* $n \to \infty$.
    ii) p is small.
    iii) $np = \lambda$, a fixed positive integer. *i.e.* $p = \frac{\lambda}{n}$ and $q = 1 - \frac{\lambda}{n}$ where λ is the mean of the binomial variate.

Binomial frequency distribution: - For N sets of 'n' trials the frequency 0,1,2… r…n. successes are given by Successive terms in the expression

$(q+p)^n = nc_0\, q^n + nc_1\, q^{n-1}\, p^1 + nc_2\, q^{n-2}\, p^2 + \ldots + nc_r\, q^{n-r}\, p^r + \ldots + p^n$

1) $p+q=1$
2) Mean $=np$
3) Varience $= T^2 = npq$
4) S.D. $= \sqrt{npq}$

12. Poission distributions: - the Poission distribution is deceived as the limit of a binomial distribution when the number of trials 'n' is very large and the probability of success 'p' is very small

1) $np=\lambda$
2) $P(X= r) = [e^{-\lambda}\, \lambda^r]/r!$
3) Mean = variance = λ

Exercise-A

1. A random variable X has the range {0,1,2}and $P(X = 0) =3c^3$, $P(X =1) = 4c - 10c^2$, $P(X=2) = 5c-1$.Then c =

1)2 2) $\frac{1}{3}$ 3) $\frac{2}{3}$ 4) $\frac{1}{9}$

2. A random variable X has its range {1,2,3}. If $P(X =1) =\frac{1}{6}$, $P(X =2) =\frac{1}{3}$, $P(X =3)= \frac{1}{2}$ then mean =

1) $\frac{7}{3}$ 2) $\frac{5}{3}$ 3) $\frac{4}{3}$ 4) $\frac{1}{3}$

3. A random variable X follows the probability distribution:

$X=x_i$	-2	-1	0	1	2	3
$P(X=x_i)$	0.1	k	0.2	2k	0.3	k

Then k= , mean= , variance=

1)0.1, 0.6, 1.96 2)0.1, 0.8, 2.8 3)0.1, 0.8, 2.16 4)0.1, 0.6, 2.16

4. The range of a random variable X is {0,1,2}. If C is a constant such that $P(X=0)=3C^3$, $P(X=1)=4C-10C^2$; $P(X=2)=5C-1$, then C=

1)1/3 2)2/3 3)5/6 4)7/8

5. The range of a random variable X is {0,1,2,3,…….} and $P(X=K)=C(K+1)/2^K$, K=0,1,2,3,….. Then $P(X\geq 2)=$

1)C 2)C-1 3)1-C 4)1-2C

6. A random variable has the following probability distribution

$X=x_i$	1	2	3	4
$P(X=x_i)$	k	2k	3k	4k

Then $P(X\leq 3)=$

1)3/10 2)3/5 3)2/5 4)1/5

7. A random variable X has the values 0,1,2. Its mean=1.2. If P(X=0)=0.3, then P(X=1)=

1)0.2 2)0.3 3)0.4 4)0.5

8. The range of a random variable X is {0,1,2,3,…..} and its probabilities are given by $P(X=K)=C(K+1)/2^K$, K=0,1,2,3,…..Then C=

1)1/4 2)1/3 3)2/3 4)1

9. The range of a random variable X={1,2,3,…..} and its probabilities are given by $P(X=K)=C^k/K!$, K= 1,2,3,….. Then C=

1)$\log_{10}2$ 2)$\log_e 2$ 3)$\log_{1/e}(1/2)$ 4)$\log_{1/e}2$

10. Two cards are drawn successively with replacement from a well shuffled pack of 52 cards. If the probability of the number of kings is formed, the mean of the random variable is

1)2/13 2)4/13 3)8/13 4)12/13

11. A die is tossed twice. Getting a number greater than 4 is considered a success. If the probability distribution of the number of successes is formed, its mean and variance are

1)2/3, 4/9 2)4/9,2/3 3)2/9,4/9 4)5/9,2/9

12. For a dealer of cycles, the probability of getting a profit of Rs.1500 is 0.6; probability of getting a loss of Rs. 1000 is 0.3 and probability of getting neither profit nor loss is 0.1, The mean profit of the dealer in Rs. Is

1)900 2)600 3)500 4)300

13. The probability for a bulb to fuse after 100 hours of use is 0.05. The probability that out of 5 such bulbs, not more than one will fuse is

1)$21(19)^4/(20)^5$ 2)$22(19)^5/(20)^5$ 3)$23(19)^4/(20)^5$
4)$24(19)^4/(20)^5$

14. The sum of the mean and variance of a Binomial distribution for 5 trials is 1.8. Then the Binomial distribution is

1)$(1/3+2/3)^5$ 2)$(1/4+3/2)^5$ 3)$(1/5+4/5)^5$ 4)$(1/6+5/6)^5$

15. In a Binomial distribution, n=400 and p=1/5. Its standard deviation is

1)1/800 2)10√2 3)4 4)8

16. The probability of a hunter hitting the target is ¼. If he fires 7 times, the probability of hitting the target atleast twice is

1)1-5/2$(3/4)^6$ 2)1-15/2$(3/4)^6$ 3)1-$(3/4)^6$ 4)-7/4$(3/4)^6$

17. On an average, one out of 10 vessels is wrecked while sailing. The probability that out of 5 vessels, 4 vessels arrive safely is

1)$(0.9)^4$ 2)$(0.1)^4$ 3)0.5$(0.9)^4$ 4)0.1$(0.9)^4$

18. If a random variable X follows a Binomial distribution with n=6 and if 9P(X=4)=P(X=2), then p=

1)1/4 2)2/4 3)3/4 4)7/8

19. Five coins whose faces are marked with 2,3 are tossed. The probability of getting a total of 12 is

1)1/8 2)5/8 3)1/16 4)5/16

20. A and B are equally strong chess players. The probability that A beats B in exactly 4 out of 5 games is

1)1/16 2)3/16 3)1/32 4)5/32

21. Six dice are thrown 729 times. The number of times you except atleast 3 dice to show either 5 or 6 is

1)233 2)249 3)396 4)433

22. A pair of dice is thrown 4 times. If getting the same number on both the dice in a throw is treated as success, thee probability of exactly 2 successes is

1)25/216 2)50/216 3)125/296 4)195/296

23. Six dice are thrown together. Appearance of either 4 or 6 on a die is counted as success. If the experiment is repeated 6561 times, the frequency of 1 success according to Binomial law is

1)64 2)243 3)1728 4)2876

24. The mean and variance of a random variable X, where X is the sum of the numbers that appear when two dice are rolled, are

1)6; 2.45 2)6; 4.5 3)7; 3.65 4)7; 5.83

25. If X is a Poisson variate such that P(X=1)=P(X=2), then P(X=3)=

1)1/3e^2 2)2/3e^2 3)4/3e^2 4)8/3e^2

26. If a random variable X has a Poisson distribution such that P(X=1)=P(X=2) its mean and variance are

1)1;1 2)2;2 3)3;3 4)4;4

27. If X is a Poisson variate such that P(X=2)=9P(X=4), then the mean and variance of X are

1)1; 1 2)2; 2 3)2/3; 2/3 4)2/√3; 2/√3

28. Six coins are tossed 6400 times. The probability of getting 6 heads, x times using Poisson distribution is

1)$6400e^{-x}$ 2)$6400e^{-x}/x!$ 3)$100xe^{-100}/100!$ 4)$100xe^{-100}/x!$

29. If the number of telephone calls an operator receives between 10.00pm to 10.10pm follow a Poisson distribution with mean equal to 3, the probability that the operator receives one call during that interval, the next day is

1)$e^{3}/3$ 2)e^{-3} 3)$e^{-3}/3$ 4)$3e^{-3}$

30. A company knows, on thee basis of past experience that 2% of its blades are defective. Probability of having 4 defective in a sample of 100 blades

1)$(2/3)e^{-2}$ 2)$(4/3)e^{-2}$ 3)$2e^{-2}$ 4)$4e^{-2}$

31. 3% of the electric bulbs manufactured by a company are defective. The probability that a sample of 100 bulbs has no defective bulb is

1)e^{-3} 2)$1-e^{-3}$ 3)$3e^{-3}$ 4)$1+e^{-3}$

32. In a random experiment, the number of successes is 3 times the number of failures. If the experiment is conducted 10 times, the probability of getting 1 success is

1)$1/4^{10}$ 2)$10/4^{10}$ 3)$20/4^{10}$ 4)$30/4^{10}$

33. A fair coin is tossed 99 times. Let X give the number of times the heads show. Then P(x=r) is maximum when r=

1)48 2)49 3)51 4)52

34. The probability of a bomb hitting a bridge is ½ and one hit is sufficient to destroy it. Thee least number of bombs required, so that the probability of the bridge being destroyed is greater than 0.8 is

1)2 2)3 3)4 4)5

35. On an average, one telephone number out of 10 is busy between 3.00a.m. and 4.00a.m on week days.The probability that, out of 4 randomly selected telephones called, none of them is busy is

1)$(1/10)^4$ 2)$(9/10)^4$ 3)$(9/10)^4$ 4)$1-(9/10)^4$

36. An experiment succeeds twice as often as it fails. The probability that in the next 6 trials, there will be atleast 5 successes is

1)250/729 2)256/729 3)265/729 4)496/729

37. The least number of times a coin must be tossed so that the probability of getting atleast one head is atleast 0.9 is

1)3 2)4 3)5 4)6

38. Four bad apples are mixed with ten good apples. The probability distribution of the number of bad apples in a draw of 2 apples at random is found. The mean of the distribution of the number of bad apples is

1)1/7 2)2/7 3)3/7 4)4/7

39. If the difference between the mean and variance of a Binomial variate is 2 and the mean is 6, then the number of trials are

1)4 2)9 3)12 4)18

40. Abook contains 200 misprints distributed randomly throughout its 200 pages. The probability that a page observed at random contains atleast two misprints is

1)1/2e 2)1-1/e 3)1-2/e 4)1-1/2e

41. In one year, on an average 1 in 1000 houses of a certain locality in a city is caught in a fire accident. If there are 5000 houses in that area, the probability that exactly two houses are caught in fire during the year is

1)$2/(5e^5)$ 2)$2/(25e^5)$ 3)$5/(2e^5)$ 4)$25/(2e^5)$

42. Ten percent of the tools manufactured in a factory are found defective. The probability that in a sample of 10 tools chosen at random, exactly two will be defective is

1)$1/2(9/10)^9$ 2)$1/2(9/10)^{10}$ 3)$1/4(9/10)^9$ 4)$1/4(9/10)^{10}$

43. In a factory manufacturing certain spare parts, 2% of the output is found defective. If spares are packed in 200 units, the probability that there are 4 defective spares in a pack is

1)$64e^{-4}$ 2)$32e^{-4}$ 3)$(64/3)\ e^{-4}$ 4)$(32/3)\ e^{-4}$

44. Cycle tyros are supplied in lots of 50 and there is a chance of 1 in 100 tyros to be defective. Using Poisson distribution, the approximate number of lots containing no defective tyros in a consignment of 1,000 lots is

1)$500e^{-1/2}$ 2)$1000e^{-1/2}$ 3)$50e^{-1/2}$ 4)$100e^{-1/2}$

45. The probability that a candidate getting a free seat in engineering through EAMCET is 1/10. Seven candidates are chosen at random from a centre. The probability that exactly two of these students get a free seat is

1)$15(0.1)^2(0.9)^5$ 2)$20(0.3)^2(0.7)^5$ 3)$21(0.1)^2(0.9)^5$
4)$22(0.3)^2(0.7)^5$

46. If a binomial distribution has mean 2.4 and variance is 1.44, then

I :n =5. II : p= 0.4

1)only I is true 2)only II is true 3)both I and II are true 4)neither I nor II true

47. I: Out of 10,000 families with 4 children each, the probability number of families all of whose children are daughters is 625

II: Out of 2560 families with 5 children each, the probability number of families all of whose children are girls is 80

1)only I is true 2)only II is true 3)both I and II are true 4)neither I nor II true

48. I: If 3% of electric bulbs manufactured by accompany are defective, then the probability that a sample of 100 bulbs has no defective is e^{-3}

II: If 2% of a given lot of manufactured parts are defective, then the probability that in a sample of 100 items has no defective is $1/e^2$.

1)only I is true 2)only II is true

3)both I and II are true 4)neither I nor II true

49. A random variable X has the following distribution

x	1	2	3	4
P(X=x)	c	2c	3c	4c

Match the following.

I.c= a)1

II.Mean= b)0.1

III.Variance= c)3

1)a,b,c 2)b,c,a 3)c,a,b 4)a,c,b

50. If X is the number of heads getting when 16 coins are tossed, them match the following.

I. Mean= a)2

II.Variance= b)4

III. Standard deviation c)8

1)c,b,a 2)b,c,a 3)c,a,b 4)a,c,b

51. A: In a binomial distribution, if n=40,q=0.75 then mean= 10.

R: If X follows binomial distribution with parameters n,p then mean=np.

1)Both A and R are true and R is the correct explanation of A

2)Both A and R are true but R is not correct explanation of A

3)a is true but R is false 4) A is false but R is true

52. A: In a binomial distribution, if n=10,q=0.6 then variance=2.4

R: If X follows binomial distribution with parameters n,p then variance =npq.

1)Both A and R are true and R is the correct explanation of A

2)Both A and R are true but R is not correct explanation of A

3)a is true but R is false 4) A is false but R is true

53. In a binomial distribution, mean is 5 and the variance is 4. Then the number of trials is
1)9 2)20 3)25 4)125 (1988)

54. Out of 10,000 families with 4 children each, the probability number of families all of whose children are daughters is (1989)
1)625 2)1250 3)2500 4)9375

55. For a binomial distribution x=4,$\sigma=\sqrt{3}$, Then P(X=r)= (1990)
1)$^{16}C_r(1/4)^r(3/4)^{16-r}$ 2)$^{12}C_r(1/4)^r(3/4)^{12-r}$
3)$^{16}C_r(3/4)^r(1/4)^{16-r}$ 4)$^{12}C_r(3/4)^r(1/4)^{12-r}$

56. If the mean and variance of a binomial distribution are 15/4 and 15/16 then the number of trials is (1991)
1)5 2)2 3)4 4)6

57. In a binomial distribution n=400,p=1/5.It's standard deviation is (1994)
1)$10\sqrt{2}$ 2)1/800 3)4 4)8

58. X is a random variable with distribution given below (1995)

X=x	0	1	2	3
P(X=x)	k	3k	3k	k

The value of k and its variance are
1)1/8,22/27 2)1/8,23/27 3)1/8,24/27 4)1/8,27/36

59. In a poisson distribution the variance is m. The sum of the terms in odd places in this distribution is (1995)
1)e^{-m} 2)e^{-m}cos h m 3)e^{-m} sin h m 4)e^{-m} cot h m

60. A random variable X has the following distribution (1998)

$X=x_I$:	1	2	3	4
$P(X=x_i)$:	k	2k	3k	4k

The value of k and P(x<3) are equal to
1)k=1/10, P(x<3)=3/5 2)k=1/10,P(x<3)=3/10
3)k=3/10,P(x<3)=1/10 4)k=1/24,P(x<3)5/12

61. The probability of a man hitting a target is ¼. If he fires 7 times, the probability of hitting the target at least twice is (1998)
1)1 – [$(5/2)(3/4)^6$] 2)1 – [$(15/2)(3/4)^6$] 3)1- [$(5 \times 3^5)/6$] 4)$1/(3/9)^6$

62. A coin is tossed 3 times. The probability of getting head once and tail two times is
1)1/3 2)1/4 3)3/8 4)1/2 (1998)

63. A random variable X follows the following distribution (1998)

X=x	0	1	2	3

P(X=x) 2/6 3/6 0/6 1/6
The mean and the variance are
1)1,1 2)1,2 3)2,1 4)2,2

64. A random variable X has the following distribution (1999)

X	1	2	3	4
P(X=x)	c	2c	3c	4c

The value of c is
1)0.1 2)0.2 3)10 4)20

65. In a Poisson distribution if P(X=0)=P(X=1) =k, the value of k is (1999)
1)1 2)1/e 3)e 4) √e

66. If the mean of a binomial distribution with 9 trials is 6, then its variance is
1)2 2)3 3)4 4) √2 (1999)

67. The probability distribution of a random variable X is given below, then k=(2000)

X=x	1	2	3	4
P(X=x)	k	4k	4k	k

1)0.1 2)0.2 3)0.3 4)0.4

68. If X is a Poisson variable with P(X=0)=P(X=1) then P(X=2)= (2000)
1)e/2 2)e/6 3)1/6e 4)1/2e

69. For binomial distribution n=10,q=0.4, then mean is (2000)
1)4 2)5 3)6 4)10

70. In a Poisson variate X, if P(X=0)=0.2 then the variance of the distribution is (2001)
1)2 2)1 3)e 4)log5

71. For a binomial variate X if n=5, and P(X=1)=8, P(X=3), then p= (2001)
1)4/5 2)1/5 3)1/3 4)2/3

72. The probability distribution of a random variable X is given below. Then its mean is $X=x_i$

$X=x_I$:	1	2	3
$P(X=x_i)$:	1/4	1/8	5/8

(2001)
1)19/8 2)5/4 3)1 4)4/5

73. A person who tosses an unbiased coin gains two points for turning up a head and loses one point for a tail. If three coins are tossed and the total score X is observed, then the range of X is (2004)
1){0,3,6} 2){-3,0,3} 3){-3,0,3,6} 4){-3,3,6}

74. If X is a Poisson variate with P(X=0)=0.8, then the variance of X is (2004)
1)$\log_e 20$ 2)$\log_{10} 20$ 3)$\log_e 5/4$ 4)054.

75. For a binomial variate X if n=6, and P(X=2)=9, P(X=4), then its variance= (2005)

1)8/9 2)1/4 3)9/8 4)4

76. If the range of a random variable X is {0,1,2,3,4,….} with $P(X=k)=[(k+1)a]/3^k$ For $k\geq 0$, then a=___ (2005)

1)2/3 2)4/9 3)8/27 4)16/8

77. In a book of 500 pages, it is found that there are 250 typing errors. Assume that Poisson law holds for the number of errors per page then the probability that a random sample of 2 pages will contain no error is (2006)

1)$e^{-0.3}$ 2)$e^{-0.5}$ 3)e^{-1} 4)e^{-2}

78. The mean and standard deviation of a binomial variate X are 4 and $\sqrt{3}$ respectively then $P(X \geq 1)$ = (2007)

1)$1-(1/4)^{16}$ 2)$1-(3/4)^{16}$ 3)$1-(2/3)^{16}$ 4)$1-(1/3)^{16}$

79. The distribution of a random variable X is given below: (2008)

X=x :	-2	-1	0	1	2	3
P(X=x):	1/10	K	1/5	2K	3/10	K

The value of k is

1)1/10 2)2/10 3)3/10 4)7/10

80. If X is a Poisson variate such that P(X =1) =P(x =2) then P(X =4)= (2008)

1)$2e^2$ 2) $\frac{1}{3e^2}$ 3) $\frac{2}{3e^2}$ 4) $\frac{1}{e^2}$

81. If m and σ^2 are the mean and variance of the random variable X, whose distribution is given by:

X = x:	0	1	2	3
P(X = x)	1/3	1/2	0	1/6

Then (2009)

1) $m = \sigma^2 = 2$ 2) $m = 1, \sigma^2 = 2$ 3) $m = \sigma^2 = 1$ 4) $m = 2, \sigma^2 = 1$

82. If X is a binomial variate with the range {0, 1, 2, 3, 4, 5, 6} and P(X = 2) = 4 P(X = 4), then the parameter p of X is (2009)

1) 1/3 2) 1/2 3) 2/3 4) 3/4

83. The transformed equation of $x^2 + y^2 = r^2$ when the axes are rotated through an angle 36^0 is (2009)

1) $\sqrt{5}X^2-4XY+Y^2=r^2$ 2) $X^2 + 2XY - \sqrt{Y^2} = r^2$
3) $X^2 - Y^2 = r^2$ 4) $X^2 + Y^2 = r^2$

84. Suppose that a random variable X follows Poisson distribution. If P(X = 1) = P(X = 2) then P(X = 5) = (2010)

1) $\frac{2}{3}e^{-2}$ 2) $\frac{3}{4}e^{-2}$ 3) $\frac{4}{15}e^{-2}$ 4) $\frac{7}{8}e^{-2}$

85. If the mean and variance of a binomial variable X are 2 and 1 respectively, then $P(X \geq 1) =$ (2010)

1) $\frac{2}{3}$ 2) $\frac{15}{16}$ 3) $\frac{7}{8}$ 4) $\frac{4}{5}$

86. The probability distribution of a random variable X is given below:

X = x	0	1	2	3
P(X = x)	$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$	$\frac{4}{10}$

Then the value of X is [2011]

1) 1 2) 2 3) 3 4) 4

87. The probability that an individual suffers a bad reaction from an injection is 0.001. The probability that out of 2000 individuals exactly three will suffer bad reaction is

[2011]

1) $\frac{1}{e^2}$ 2) $\frac{2}{3e^2}$ 3) $\frac{8}{3e^2}$ 4) $\frac{4}{3e^2}$

88. Suppose X follows a binomial distribution with parameters n & p, where 0 < p < 1 $\frac{P(X=r)}{P(X=n-r)}$ is independent of n for every r, then p =

[2012]

1) $\frac{1}{2}$ 2) $\frac{1}{3}$ 3) $\frac{1}{4}$ 4) $\frac{1}{8}$

89. If X is a Poisson variate such that $\alpha = P(X=1) = P(X=2)$ then $P(X=4) =$

[2012]

1) 2α 2) $\frac{\alpha}{3}$ 3) αe^{-2} 4) αe^{2}

90. The random variable takes the value 1, 2, 3, …….., m If P(X = n) = $\frac{1}{m}$ to each n, then the variance of X is [2013]

1) $\frac{(m+1)(2m+1)}{6}$ 2) $\frac{m^2-1}{12}$ 3) $\frac{m+1}{2}$ 4) $\frac{m^2+1}{12}$

91. If X is a Poisson variate & P(X = 1) = 2P(X = 2) then P(X =3) = [2013]

1) $\frac{e^{-1}}{6}$ 2) $\frac{e^{-2}}{2}$ 3) $\frac{e^{-1}}{2}$ 4) $\frac{e^{-1}}{3}$

92. A random variable X has the probability distribution given below. Its variance is (2014)

1) $\frac{4}{3}$ 2) $\frac{5}{3}$ 3) $\frac{10}{3}$ 4) $\frac{16}{3}$

93. If the mean & variance of a binomial variate X are 8 & 4 respectively then P(X < 3) = (2014)

1) $\frac{137}{2^{16}}$ 2) $\frac{697}{2^{16}}$ 3) $\frac{265}{2^{16}}$ 4) $\frac{265}{2^{15}}$

94. X is a binomial variate with parameters n = 6 & p. If 4P(X = 4) = P(X = 2), then p is (2015)

1) $\frac{1}{2}$ 2) $\frac{1}{3}$ 3) $\frac{1}{4}$ 4) $\frac{1}{6}$

95. The Probability of a coin showing head is p. 100 such coins are tossed. If the probability of 50 coins showing heads is same as the probability of 51 coins showing heads, then p = (2015)

1) $\frac{1}{2}$ 2) $\frac{49}{100}$ 3) $\frac{51}{101}$ 4) $\frac{50}{101}$

96. The probability distribution of a random variable is given below

X = x	0	1	2	3	4	5	6	7
P(X = x)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2 + K$

Then P(0 < X < 5) = (2015 A.P)

1) 1/10 2) 3/10 3) 8/10 4) 7 / 10

97. On an average nine out of 10 ships that have departed at A reach B safely. The probability that out of five ships that have departed at A ay least four will reach B safely is (2016)

1) $14\,(0.9)^5$ 2) $1.4\,(0.9)^5$ 3) $0.14\,(0.9)^4$ 4) $1.4\,(0.9)^4$

98. In a city 10 accidents take place in a span of 50 days. Assuming that the number of accidents follow the Poisson distribution, the probability that three or more accidents occur in a day is (2016AP)

1) $\sum_{k=3}^{\infty}\frac{e^{-\lambda}\lambda^k}{k!}, \lambda = 0.2$ 2) $\sum_{k=3}^{\infty}\frac{e^{\lambda}\lambda^k}{k!}, \lambda = 0.2$

3) $1-\sum_{k=3}^{\infty}\frac{e^{-\lambda}\lambda^k}{k!}, \lambda = 0.2$ 4) $1+\sum_{k=3}^{\infty}\frac{e^{-\lambda}\lambda^k}{k!}, \lambda = 0.2$

99. The probability distribution of a random variable X is given below (2017)

X = k	0	1	2	3	4
P(X = k)	0.1	0.4	0.3	0.2	0

The variance of X is

1) 1.6 2) 0.24 3) 0.84 4) 0.75

100. The probability distribution of a random variable X is given below. (2017)

X	1	2	3	4	5	6
P(X = x)	a	a	a	b	b	0.3

If mean of X is 4.2, then a & b are respectively equal to

1) 0.3, 0.2 2) 0.1, 0.4 3) 0.1, 0.2 4) 0.2, 0.1

101. If A & B are the variances of the 1st 'n' even numbers & 1st 'n' odd numbers respectively then (2017)

1) A = B 2) A > B 3) A < B 4) A = B + 1

102. If X is a random variable with the following probability distribution (2017AP)

X = x	- 3	6	9
P(X = x)	1 / 6	1 / 2	1 / 3

Then the variance of X is

1) 65/4 2) 65/2 3) 65/3 4) 65

103. 6 coins are tossed 320 times. The probability of getting 5 heads 2 times is (2017AP)

1) $30^2 \times e^{-30} / 2$ 2) $30 \times e^{-30}$ 3) $30^2 \times e^{-30}$ 4) $30 \times e^{-10}$

KEY

1) 2	2) 1	3) 3	4) 1	5) 4	6) 2	7) 1	8) 1	9) 2	10) 1
11) 1	12) 2	13) 4	14) 3	15) 4	16) 1	17) 3	18) 1	19) 1	20) 4
21) 2	22) 1	23) 1	24) 3	25) 4	26) 3	27) 2	28) 4	29) 1	30) 4
31) 1	32) 4	33) 2	34) 2	35) 2	36) 2	37) 2	38) 4	39) 4	40) 3
41) 4	42) 1	43) 4	44) 2	45) 3	46) 2	47) 3	48) 1	49) 2	50) 1
51) 1	52) 1	53) 3	54) 11	55) 1	56) 1	57) 4	58) 4	59) 2	60) 2
61) 1	62) 3	63) 1	64) 1	65) 2	66) 1	67) 1	68) 4	69) 3	70) 4
71) 2	72) 1	73) 3	74) 3	75) 3	76) 2	77) 3	78) 2	79) 1	80) 3
81) 3	82) 1	83) 4	84) 3	85) 2	86) 1	87) 4	88) 1	89) 2	90) 2
91) 1	92) 1	93) 1	94) 2	95) 3	96) 3	97) 4	98) 1	99) 3	100) 3
101) 1	102) 1	103) 1	104)	105)	106)	107)	108)	109)	110)

Exercise-B

1. A coin is tossed three times the probability of getting head once and tail two times is

1)1/3 2)1/4 3)3/8 4)1/2

2. A random variable X has the following distribution

x : -3 -2 -1 0 1 2 3

P(X =x) : *0.05* *0.1* *0.3* *0* *0.3* *0.15* *0.1*

The mean and variance are

1) $\mu = 0.25, \sigma^2 = 2.8875$ 2) $\mu = 25, \sigma^2 = 2.8$

3) $\mu = 0.17, \sigma^2 = 3.125$ 4) $\mu = 0.13, \sigma^2 = 0.654$

3. If the difference between the mean and variance of a binomial distribution for 5 trials is $\frac{5}{9}$, then the distribution is

1) $\left(\frac{1}{5}-\frac{1}{3}\right)^6$ 2) $\left(\frac{1}{3}+\frac{2}{3}\right)^2$ 3) $\left(\frac{1}{2}+\frac{2}{3}\right)^4$ 4) $\left(\frac{1}{3}+\frac{2}{3}\right)^6$

4. If the mean of the binomial distribution is 100. Then standard deviation lies in the interval

1)[0,7) 2)[1,7) 3)[0,10) 4)[1,11)

5. If X is a Poisson variate such that P(X =2) = 9P(x =4)+90P(X =6), then mean of X is

1)1 2)2 3) $\frac{1}{2}$ 4) $\frac{3}{2}$

6. If 3% if electric bulbs manufactured by a company are defective, then the probability that a sample of 100 bulbs has no defective is

1) $\frac{1}{e^2}$ 2) $\frac{2}{e^2}$ 3) $\frac{1}{e}$ 4) e^2

7. If ten percent of the tools produced in a factory turn out to be defective, then the probability that in a sample of 10 tools chosen at random. Exactly two will be defective by using Poisson distribution is

1) e^2 2) $\frac{1}{e^2}$ 3) $\frac{1}{e}$ 4) $\frac{1}{2e}$

8. Cycle tyres are supplied in lots of 10 and there is a chance of 2 in 1090 tyres to be defective. Using Poisson's distribution the approximate number of lots containing no defective tyres in a consignment of 10,000 lots is

1)188 2)189 3)819 4)918

9. Six dice are thrown together. Appearance of either 4 or 6 on a die is counted as success. If the experiment is repeated 6561 times, the frequency of 1 success according to Binomial law is

1) 64 2)243 3)1728 4)2876

10. The range of a random variable X={1,2,3,…..} and its probabilities are given by $P(X=K)=C^k/K!$, K= 1,2,3,….. Then C=

1)$\log_{10}2$ 2)$\log_e 2$ 3)$\log_{1/e}(1/2)$ 4)$\log_{1/e}2$

KEY

1) 3	2) 4	3) 4	4) 3	5) 1	6) 1	7) 4	8) 3	9) 3	10) 2

11. CIRCLES

1. Let C is a fixed point and r is a constant then the locus of the point 'P' which moves such that CP= r is called a circle. C is called the centre of the circle and r is called the radius of the circle

2. If the centre is C (h,k) and radius is r then the equation of the circle is $(x - \mathrm{h})^2 + (y - \mathrm{k})^2 = r^2$.

3. When the centre is the origin (0, 0) the equation of the circle is $x^2 + y^2 = r^2$.

4. The general second degree equation of the circle is $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ if (i) $a = b \neq 0$ (ii) $h = 0$ (iii) $g^2 + f^2 - ac \geq 0$ then centre of the circle is $\left(\frac{-g}{a}, \frac{-f}{a}\right)$ and radius $\frac{\sqrt{g^2 + f^2 - ac}}{|a|}$

5. The standard general equation of the circle is $x^2 + y^2 + 2gx + 2gy + c = 0$ the centre is $(-g, -f)$ and the radius is $\sqrt{g^2 + f^2 - c}$.

6. If $A(x_1, y_1)$ and $B(x_2, y_2)$ are the ends of a diameter $\overline{AB}$ of a circle its equation is given by $(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$.

7. The parametric equations of the circle with centre C (h, k) and radius r is given by $x = \mathrm{h} + r\cos\theta, y = \mathrm{k} + \mathrm{r}\sin\theta$ where $0 \leq \theta \leq 2\pi$.

8. If $P(x_1, y_1)$ is a point and S is *a* circle with centre C and radius r *then*r $CP^2 - r^2$ is called the 'power ' w. r. t. the circle.

9. Tangents of the circle $x^2 + y^2 = r^2$ with slope m is $y = mx \pm r\sqrt{1 + m^2}$

10. A given line $lx + my + n = 0$ is normal to $S = 0$ if and only if it passes through the centre *i.e.* $lg + mf = n$.

11. If $lx + my + n = 0$ is a given line the pole w. r. t. to the circle $S = 0$ is $\frac{x_1 + g}{l} = \frac{y_1 + f}{m} = \frac{r^2}{lg + mf - n}$

12. The pole of $lx + my + n = 0$ w. r. t. circle $x^2 + y^2 = r^2$ is $\left(\frac{-r^2 l}{n}, \frac{-r^2 m}{n}\right)$

13. The lines $l_1x + m_1y + n = 0$ and $l_2x + m_2y + x_2 = 0$ are conjugate lines *w. r. t.* the circle $S = 0$ if and only if $r^2(l_1l_2 + m_1m_2) = (l_1g + m_1f - n_1)(l_2g + m_2f - n_2)$.

14. When the equation of the circle is $x^2 + y^2 = r^2$ then the above condition reduces to $r^2(l_1l_2 + m_1m_2) = n_1n_2$.

15. Equation of the pair of tangents of $S = 0$ passing through an external point $P(x_1, y_1)$ is $S_1^2 = S\,S_{11}$.

.

16. If r=0 then the circle is called point circle.

17. a) The line segment joining any two points A and B on a circle is called a chord of the circle.
    b) The line AB is called a secant of the circle

18. If a chord passes through the centre, it is called a diameter of the circle.

19. Given three non collinear points A, B and C, there exists a unique circle that passes through them. It is known as the circumcircle of ΔABC. Therefore the perpendicular bisector of each chord of the circle passes through the centre of the circle.

20. We use the following notation in circles.
    i. $S \equiv x^2+y^2\ 2gx\ +2fy\ +c$
    ii. $S_1 \equiv xx_1 + yy_1 +g(x-x_1)\ +f(y+y_1) +c$
    iii. $S_{11} \equiv x_1^2+y_1^2 + 2gx_1 +2fy_1 +c$
    iv. $S_{12} \equiv xx_1 + y_1y_2 +g(x_1+x_2) +f(y_1+y_2) +c.$

21. Power of a point $P(x_1,y_1)$ with respect to the circle S=0 is equal to $S_{11} = 0$
    i. If the point $P(x_1,y_1)$ lies inside the circle $S = 0$, if $S_{11} < 0$
    ii. If the point $P(x_1,y_1)$ lies outside the circle S=0 if $S_{11} > 0$
    iii. If the point $P(x_1,y_1)$ lies on the circle S=0 if $S_{11} = 0$.

22. A straight line having exactly one point in common with a given circle is called a tangent of that circle. radius of the circle = ⊥ distance between the line and

23. The equation of tangent to the circle $S \equiv 0$ is $S_1 \equiv 0$.

24. Equation of tangent to the circle $x^2 +y^2 = r^2$ is $x\,x_1 +y\,y_1 - r^2 = 0$.

25. $lx +my +n =0$ to touch $x^2+y^2= r^2$ is $n\ \ r(l+m)$ and point of contact is ($\frac{-lr^2}{n}, \frac{-mr^2}{n}$)

26. $x/a +y/b =1$ to touch $x^2+y^2 = r^2$ is $a^2b^2 = r^2(a^2+b^2)$

27. $x\cos\alpha +y\sin\alpha = p$ to touch $x^2+y^2 = r^2$, tangent with slope 'm' is

    $$y - y_1 = m(x-x_1) \pm r\sqrt{m^2+1}$$

28. $lx +my+n =0$ to touch $x^2 +y^2+2gx+2fy +c =0$ is $(l^2+m^2)(g^2+f^2-c) = (lg+mf-n)^2$

29. The intercept made by the circle $x^2+y^2+2gx+2fy+c=0$ on

x –axis is $2\sqrt{g^2-c}$ and on Y-axis $2\sqrt{f^2-c}$.

30. Equation of the tangent at 'θ' of $x^2+y^2=r^2$ is $x\cos\theta+y\sin\theta=r$.

31. Equation of the normal at 'θ' of $x^2+y^2=r^2$ is $x\sin\theta-y\cos\theta=0$.

32. Equation of the chord joining the two points θ_1 and θ_2 of the circle $x^2+y^2=r^2$ is

$x\cos(\theta_1+\theta_2)/2+y\sin(\theta_1+\theta_2)/2=r\cos(\theta_1-\theta_2)/2$

Note: power of a point on the circle is zero.

power is positive of point lies outside the circle

power is negative if point lies inside the circle

The minimum power of a point with respect to a circle with center 'C' radius 'r' is'$-r^2$'(it is at C)

The locus of the point whose powers with respect to a circle are equal is a circle, concentric with given circle.

33. If point lies outside the circle, then the length of the tangent from that point is square of that power.

34. The length of the tangent from the point $P(x_1, y_1)$ w.r.t the circle $S=0$ is $\sqrt{S_{11}}$.

35. The equation of chord (Secant line) joining the two points (x_1, y_1) and (x_2, y_2) of a circle $S=0$ is $S_1+S_2=S_{12}$.

36. Equation of the chord of contact of $P(x_1, y_1)$ with respect to the circle $S=0$ is $S_1=0$.

37. The locus of point of intersection of tangents drawn at ends of a chord is called polar and the point from which the chord is drawn is called pole.

38. Polar of the point $P(x_1, y_1)$ with respect to the circle $S=0$ is $S_1=0$.

Note: If P lies outside the circle, then polar is chord of contact of P.

If P lies on the circle, then polar is tangent at P.

If P lies inside the circle, then polar is a line having no point in common with the circle.

For center there is no pole.

For diameter there is no pole.

For one point if it exists, there exists only one polar.

For one point if it exists, there only one pole.

Polars of collinear points are concurrent.

Poles of concurrent lines are collinear.

39 If polar of a point P passes through another point Q, then the polar of Q passes through P. Two such points are called conjugate points.

40. $P(x_1, y_1)$ and $Q(x_2, y_2)$ are conjugate points w.r.t. the circle $S=0 \Leftrightarrow S_{12}=0$ For a point there exists on infinite number of conjugate points.

41. Two straight lines L_1 and L_2 are said to be conjugate lines with respect to a circle S = 0 if the pole of each line w.r.t. s=0 lies on the other line.

42. The lines $l_1x+m_1y+n_1=0$ and $l_2x+m_2y+n_2=0$ are conjugate lines with respect to a circle S = 0 if and only if $r^2(l_1l_2+m_1m_2)=(l_1g+m_1f-n_1)(l_2g+m_2f-n_2)$ where 'r' denotes the radius of the circle S=0 In particular when the circle is $x^2+y^2=r^2$,this condition reduces to $r^2(l_1l_2+m_1m_2)=n_1n_2$.

43. Pole of the line lx+my+n =0 with respect to the circle $x^2+y^2=r^2$ is $\left[-\frac{lr^r}{n},-\frac{mr^2}{n}\right]$

44. When c is the centre of a circle and P is any point CP such that $CP.CQ=r^2$ is called the inverse point on circle.

45. The inverse point of P with respect to a circle is the intersection point of CP and polar of P. The polar of P w.r.t S=0 is perpendicular to the line CP. Hence the inverse point of P w.r.t S=0 is perpendicular to the line CP. Hence the inverse point of P w.r.t S=0 is the foot of the perpendicular from centre on the polar of P.

Note:

If P lies inside of a circle, then its inverse point lies outside of the circle.
If P lies on the circle then inverse point of P is itself.
Inverse point of center does not exist.
Every pair of inverse points is a pair of conjugates points, but the converse is not true.
If an inverse point of a point exists it is unique.
P and Q lie on same side of the center C.

47. The inverse point of (x_1, y_1) with respect to the circle $x^2+y^2+2gx+2fy+c=0$ is $\left[-\frac{gc}{g^2+f^2}, \frac{fc}{g^2+f^2}\right]$.

48. Equation of the chord of the circle S =0 whose mid point is (x_1, y_1) to the circle S =0 is $S^2_1 = SS_{11}$.

49. Locus of point of intersection of perpendicular tangents of the circle $x^2+y^2=a^2$ is $x^2+y^2=2r^2$
$(x-x_1)^2(y-y_1)^2 = r^2$ is $(x-x_1)^2(y-y_1)^2\ 2r^2$
$x^2+y^2+2gx+2fy+c=0$ is $x^2+y^2+2gx+2fy+c = g^2+f^2-c$

50. The area of the triangle formed by the chord of contact of the point $P(x_1, y_1)$ with respect to the circle $x^2+y^2=r^2$ and pair of tangents from P is $\frac{r\left(x_1^2+y_1^2-r^2\right)^{\frac{3}{2}}}{x_1^2+y_1^2}$.

51. The area of the triangle formed by the polar of $P(x_1, y_1)$ with respect to the circle $x^2+y^2=r^2$ and coordinate axes is $\frac{a^4}{2|x_1, y_1|}$

52. Equation of the secant line of the circle S=0 in terms of mid point $P(x_1,y_1)$ of the chord cut of by S=0 on it is $S_1=S_{11}$.

53. The circle circumscribing the triangle formed by coordinate axes and ax+by+c =0 is $ab(x^2+y^2)+c(bx+ay)=0$

Exercise-A

1. The Equation of the circle passing through (4,5) and having centre at (2,2) is
1) $x^2+y^2+4x+4y-5=0$ 2) $x^2+y^2-4x-4y-5=0$
3) $x^2+y^2-4x-13=0$ 4) $x^2+y^2-4x-4y+5=0$

2. The equation of the unit circle concentric with $x^2+y^2-8x+4y-8=0$ is
1) $x^2+y^2-8x-4y-8=0$ 2) $x^2+y^2-8x+4y-28=0$
3) $x^2+y^2-8x+4y+8=0$ 4) $x^2+y^2-8x+4y+19=0$

3. The angle between the tangents drawn from (0,0) to $x^2+y^2+4x-6y+4=0$ is
1) $Sin^{-1}\left(\frac{12}{13}\right)$ 2) $Cos^{-1}\left(\frac{12}{13}\right)$ 3) $Sin^{-1}\left(\frac{2}{3}\right)$ 4) $Sin^{-1}\left(\frac{5}{13}\right)$

4. The polar of (-2,3) with respect to $x^2+y^2-4x6y+5=0$ is

1) x = 0 2)y = 0 3)y = 1 4)x = 1

5. The number of common tangents to the circles $x^2 + y^2 - x = 0$ and $x^2 + y^2 + x = 0$ is
1)2 2)1 3)4 4)3

6. The circles $x^2 + (y-1)^2 = 9$ and $(x-1)^2 + y^2 = 25$ are such that
1) they touch each other
2) one circle lies inside the other
3) they are non intersecting and lie external to each other
4) they intersecting in two points

7. The equation of the circle whose centre is (2,3) and radius 3, is
1)$x^2+y^2-4x-6y-4=0$ 2)$x^2+y^2-4x-6y+4=0$
3)$x^2+y^2+4x+6y+4=0$ 4)$x^2+y^2+4x+6y-4=0$

8. If $2x^2+by^2-3x+2y-1=0$ represents a circle, its radius is given by
1)√21/4 2)√5/4 3)5√5/4 4)√21/2

9. If (-4,-3) is centre of $x^2+y^2+2gx+2fy=0$ the radius of the circle is
1)25 2) √5 3)5 4)0

10. If radius of the circle $x^2+y^2-6x+8y+c=0$ is 6 units, value of 'c' is
1)11 2)-10 3)25 4)-11

11 The centre of the circle passing through the points (3,4), (3,2), (1,4) is
1)(2,3) 2)(4,6) 3)(3,2) 4)(-2,-3)

12. The centre of the circle passing through the point (0,0), (a,0), (0,b) is
1)[(a+b)/2,0] 2)(a/2,b/2) 3)(a,b) 4)[(a+b)/2,(a+b)/2]

13. If P(3,4) is a point on the circle $x^2+y^2+4x-6y-13=0$ the other end of diameter of the circle through P is
1)(-7,2) 2)(7,-2) 3)(2,14) 4)(2,-14)

14. If the line 3x –4y –7 =0 and 2x-3y-5 =0 are two diameters of a circle of area 49π square units, the equation of the cicle is
1) $x^2+y^2-2x+2y+-62=0$ 2) $x^2+y^2-2x+2y-47=0$
3) $x^2+y^2+2x-2y-47=0$ 4) $x^2+y^2+2x-2y-62=0$

15. If the circle described on the line joining the points (0,1) and (α,β) as diameter cuts the axis of X at the points whose abscissae are roots of the equation $x^2-5x+3=0$ then (α,β)=

1)(3,5) 2)(-3,-5) 3)(5,3) 4)(-5,3)

16. The abscissae of two points A,B are roots of $x^2+4x-45=0$ and ordinates of A,B are roots of $y^2-7y+12=0$ then centre of the circle for which AB is diameter is
1)(2,7/2) 2)(4,-7) 3)(-2,7/2) 4)(-2,-7/2)

17. Origin is the centre of the circle which circumscribes an equilateral triangle. The length of a median of this triangle is 3a. Then the equation of the circle is
1)$x^2+y^2=a^2$ 2)$x^2+y^2=4a^2$ 3)$x^2+y^2=9a^2$ 4)$x^2+y^2=9a^2/4$

18. The equation of the circle concentric with the circle $x^2+y^2-8x-12y+15=0$ and passing through (5,4) is
1)$x^2+y^2-8x-12y+47=0$ 2) $x^2+y^2+8x+12y-47=0$
3) $x^2+y^2-8x+12y+47=0$ 4) $x^2+y^2-8x-12y-47=0$

19. The diameter of the circle passing through origin and making intercepts a,b on the axes is given as
1)$\sqrt{(a^2+b^2)}$ 2)$\sqrt{(a^2+b^2)}/2$ 3)$\sqrt{(a^2+b^2)}/4$ 4)$2\sqrt{(a^2+b^2)}$

20. If (3,x) and (5,3) are the ends of a diameter of a circle with centre (y,2), the values of x and y are
1)x=4, y=1 2)x=1, y=4 3)x=2, y=8 4)x=3, y=5

21. The equation of circle whose parametric equations are $x=4+5\cos\theta$, $y=3+5\sin\theta$ is
1)$x^2+y^2-8x-6y=0$ 2) $x^2+y^2-8x-6y+25=0$
3) $x^2+y^2-4x-3y-25=0$ 4) $x^2+y^2-4x-6y-12=0$

22. If (2,0), (0,1),(4,0), (0,a) are concyclic then a=
1) 8 2) 3 3)4 4) 2

23. Equation of the circle having centre (-1,3) and having 2x-y=5 as tangent line is
1)$x^2+y^2-2x+6y-10=0$ 2) $x^2+y^2-2x+6y+10=0$
3) $x^2+y^2-2x+6y-20=0$ 4)$x^2+y^{2+}2x-6y-10=0$

24. If a circle with centre (4,3) touch the line 5x-12y-10=0 its diameter has length
1)2 2)4 3)6 4)1

25. The normal at (2,3) for the circle $x^2+y^2+4x+6y-39=0$ cuts the circle again at
1)(0,0) 2)(-6,-9) 3)(-2,-3) 4)(-4,-6)

26. The area of triangle formed by tangents drawn from (4,3) to $x^2+y^2=9$ and chord of contact of this circle w.r.t (4,3) is
1)96/25 2)192/25 3)384/25 4)48/25

27. The length of the chord intercepted by $x^2+y^2-4x+6y+1=0$ on the line $3x-y-1=0$
1)$4\sqrt{7}/\sqrt{5}$ 2)$2\sqrt{7}/\sqrt{5}$ 3)$8\sqrt{7}/\sqrt{5}$ 4)$4\sqrt{/5}$

28. The intercept made on X-axis by $x^2+y^2-8x+2y+12=0$ is of length
1)5 2)3 3)4 4) circle does not exist

29. The intercept made on Y-axis by $x^2+y^2-x-3y-4=0$ is of length
1)4 2)5 3)6 4)8

30. The polar of (2,3) w.r.t $x^2+y^2+6x+8y-96=0$ is
1)$5x+7y-48=0$ 2)$5x+7y+78=0$ 3)$5x+7y+48=0$ 4)$5x+7y-78=0$

31. The chord of contact of the circle $x^2+y^2-5x+4y-2=0$ w.r.t (2,5) is
1)$x-14y-6=0$ 2)$14x+y-6=0$ 3)$x+14y+6=0$ 4)$x-14y+6=0$

32. The pole of $x+2y-1=0$ w.r.t the circle $2x^2+2y^2=11$ is
1)(11,11) 2)(22,11) 3)(11/2,11) 4)(11,22)

33. If an equilateral triangle inscribed in the circle $x^2+y^2=a^2$, the length of each side is
1) $\sqrt{3}/2a$ 2) $\sqrt{3}a$ 3)$2a/\sqrt{3}$ 4)$a/\sqrt{3}$

34. The locus of poles of tangents of the circle $x^2+y^2=a^2$ w.r.t the circle $x^2+y^2-2ax-a^2=0$ is given by
1)$y^2=4ax$ 2)$y^2+ax=0$ 3)$y^2+4ax=0$ 4)$y^2-ax=0$

35. The equation of the circle touching y-axis at (0,2) and making intercepts of 8units on x-axis is
1)$(x-3)^2+(y-2)^2=25$ 2) $(x-5)^2+(y-3)^2=5$
3) $x^2+y^2-5x-4y+4=0$ 4)$(x-5)^2-((y-3)^2$

36. The middle point of chord cut by $x^2+y^2-4x+6y+1=0$ on the line $3x-y+1=0$
1)(3,-1) 2)(-1,-2) 3)(2,7) 4)(-2,5)

37. The inverse point of (1,2) w.r.t $x^2+y^2=25$ is
1)(5,5) 2)(5,10) 3)(7.9) 4)(9,8)

38. If $kx+3y-1=0$, $2x+y+5=0$ are conjugate lines w.r.t the circle $x^2+y^2-2x-4y-4=0$ the value of k is
1)2 2)-2 3)1 4)-1

39. The number of common tangents that can be drawn to circles $x^2+y^2-8x-6y+21=0$, $x^2+y^2-2y-15=0$

1)0 2)1 3)2 4)3

40. If length of tangent from a point P on x-y+1=0 to the circle $x^2+y^2-4x=0$ is of length √5, P can be
1)(3,4) 2)(-2,-1) 3)(1,2) 4)(2,3)

41. The circle touching the X-axis at (0,0) and the line 4x-3y=24 is
1)$x^2+y^2-25y=0$ 2)$x^2+y^2+6y=0$ 3)$x^2+y^2+12y=0$ 4)$x^2+y^2+26y=0$

42. The equation of the circle passing through Y-axis at origin and passing through (b,c) is
1)$b(x^2+y^2)=(b^2+c^2)x$ 2) $c(x^2+y^2)=(b^2+c^2)y$
3) $b(x^2+y^2)=(b^2+c^2)y$ 4)$c(x^2+y^2)=(b^2+c^2)y$

43. The lines 2x-3y=11 and 3x-4y=18 are two diameters of a circle of area 154 sq.unit then the equation of this circles is
1)$x^2+y^2+2x-2y-62=0$ 2) $x^2+y^2-4x+6y-36=0$
3) $x^2+y^2-12x-2y-62=0$ 4) $x^2+y^2+2x-2y+62=0$

44. The lines 3x-4y+4=0 and 6x-8y-7=0 are tangents to the same circle. The radius of the circle is
1)3/2 2)3/4 3)3/8 4)8/3

45. If (3,-2) is the midpoint of the chord AB of the circle $x^2+y^2-4x+6y-5=0$ then AB =
1)4 2)8 3)12 4)16

46. The centres of three circles $x^2+y^2-10x+9=0$, $x^2+y^2-6x+2y+1=0$, $x^2+y^2-9x-4y+2=0$ lie on the line
1)x-2y=5 2)y-2x=5 3)2y-x=5 4)x-3=0

47. For the circle $x^2+y^2-8x-10y+16=0$, the point (-3,4)
1)lies inside the circle 2)lies outside the circle
3)lies on the circle 4)is the centre of the circle

48. The equation of the circle through (1,0) and (0,1) and having smallest possible radius is
1) $x^2+y^2-x-y=0$ 2) $2x^2+2y^2-x-y=0$
3) $x^2+y^2+x+y=0$ 4) $x^2+y^2+2x-2y-62=0$

49. The lines 2x-3y=5 and 3x-4y=7 are two diameters of a circle of area 154sq.unit. Then the equation of this circle is
1) $x^2+y^2+2x-2y-62=0$ 2) $x^2+y^2-2x+2y-47=0$
3) $x^2+y^2-12x-2y-47=0$ 4) $x^2+y^2-2x+2y-62=0$

50. A variable circle passes through the fixed point A(p,q) and touches x-axis. The locus of the other end of the diameter through A is

1)$(x-p)^2=4qy$ 2)$(y-q)^2=4px$ 3)$(y-p)^2=4qx$ 4)$(x-q)^2=4py$

51. If the lines $2x+3y+1=0$ and $3x-y-4=0$ lie along diameters of a circle of circumference 10π, then the equation of the circle is
1) $x^2+y^2-2x+2y-23=0$ 2) $x^2+y^2+2x-2y-23=0$
3) 1)$x^2+y^2+2x+2y-23=0$ 4) 1)$x^2+y^2-2x-2y-23=0$

52. The line $y=x+a\sqrt{2}$ touches the circle $x^2+y^2=a^2$ art p. The coordinates of p are
1)(a,a) 2)(a/2,a/2) 3)$(a/\sqrt{2},a/\sqrt{2}$ 4)$(-a/\sqrt{2},a/\sqrt{2})$

53. The pole of the line $8x-2y=11$ with respect to the circle $2x^2+2y^2=11$ is
1)(4,1) 2)(4,-1) 3(3,1) 4)(4,2)

54. Equation of the circle with extremities of the diametric (3,4) and (-7,2)
1)$x^2+y^2+4x-6y+13=0$ 2) $x^2+y^2+4x-6y-13=0$
3) $x^2+y^2-4x+6y+13=0$ 4)$x^2-y^2-4x-6y-13=0$

55. Equation of the tangent at (-1,2) to the circle whose centre is (4,1) is
1)$5x+y-7=0$ 2) $5x-y+7=0$ 3) $5x+y+7=0$ 4) $5x-y-7=0$

56. Equation of the circle touching the co-ordinate axes and the line $3x-4y=12$ and whose radius is greater than unity is
1)$x^2+y^2-12x+12y=0$ 2) $x^2+y^2 -12x+12y +36=0$
3) $x^2+y^2-12y-10=0$ 4)$x^2-y^2=0$

57. A line passing through P(2,5) with the circle $x^2+y^2-2x-5y-3=0$ at A and B then PA.PB =
1)1 2) 2 3) 3 4) -3

58. The value of p for which the circle $x^2+y^2-3x+py-5=0$ and $4x^2+4y^2-12x-y-9=0$ becomes centric is
1) 1/8 2) -1/8 3) ¼ 4) -1/4

59. The tangents to the circle $x^2-y^2=169$ at (5,12), (12-5) are
1) parallel 2) perpendicular 3) coincide 4) collinear

60. The pole of the line $x+y-4=0$ w.r.t the circle $x^2+y^2=4$ is
1)(1,1) 2)(2-1) 3) (3-1) 4) (0,0)

61. The midpoint of the chord $2x+y=5$ of the circle $x^2+y^2=9$ is
1) (-2,-1) 2) (-2,-1) 3) (2,1) 4) (2,-1)

62. If (2-1) and (3,p) are conjugate points w.r.t the circle $x^2+y^2-2x+4y-9=0$ then p=
1)8 2) 6 3) 10 4) 4

63. Length of the chord of the circle $x^2+y^2=49$ whose midpoint is (-3,4) is
1) 3 √6 2) 4 √6 3) 5 √ 6 4) 5

64. The area of triangle formed by tangents from (2,3) to the circle $x^2+y^2=4$ and chord of contact is
1)54/15 2) 35/12 3) 55/13 4)54/13

65. The condition for the line xcosα +ysinα = p to touch the circle $x^2+y^2=a^2$ is
1)p 2) p+a =0 3) p=a 4) p-a=0

66. Which of the following is a circle touching both the axes and is passing through (2,1)
1) $x^2+y^2-2x-2y+1=0$ 2) $x^2+y^2+2x+2y+1=0$
3) $x^2+y^2-2x-2y-1=0$ 4) $x^2+y^2-2x+2y-1=0$

67. The Circle that touch the axes at (2,0) and () 0,-2) is
1) $x^2+y^2+4x-4y+4=0$ 2) $x^2+y^2-4x+4y+4=0$
3) $x^2+y^2-4x-4y+4=0$ 4) $x^2+y^2-4x+4y+8=0$

68. The inverse point of (1,2) w.r.t $x^2+y^2-4x+4y-5=0$ is
1)(0,0) 2)(1,0) 3)(0,1) 4)(1,1)

69. The internal centre of similitude for the circles $x^2+y^2+6x-2y+1=0$ and $x^2+y^2-x+4y-5=0$ is
1) $\left(0,\frac{5}{2}\right)$ 2) $\left(\frac{-5}{2},0\right)$ 3) $\left(0,\frac{-5}{2}\right)$ 4) $\left(\frac{5}{2},\frac{-5}{2}\right)$

70. If the lengths of tangents drawn from P to $x^2+y^2-4x-6y-12=0$ and $x^2+y^2+2x+3y+1=0$ are in the ratio 1:4 respectively, the locus of P is
1) $15(x^2+y^2)-66x-99y-193=0$
2) $15(x^2+y^2)+66x+99y+193=0$
3) $15(x^2+y^2)+66x+99y-193=0$
4) $15(x^2+y^2)-66x+99y+193=0$

71. The equation of the circle touching Y –axis at origin and passing through (b,c) is
1) $b(x^2+y^2)=(b^2+c^2)x$ 2) $c(x^2+y^2)=(b^2+c^2)x$
3) $b(x^2+y)^2=(b^2+c^2)y$ 4) $c(x^2+y)^2=(b^2+c^2)y$

72. The intercept made on X –axis by $x^2+y^2-8x+2y+12=0$ is of length
1)5 2)3 3)4 4)circle does not cut the X-axis

73. The intercept made on Y –axis by $x^2 + y^2 - x - 3y - 4 = 0$ is of length
1)4 2)5 3)6 4)8

74. The condition that the circles $x^2 + y^2 + 2ax - 6y + c = 0$ and $x^2 + y^2 + 2by + c = 0$ may touch each other is
1) $c^2 = a^2 + b^2$ 2) $c = ab$ 3) $\frac{1}{c} = \frac{1}{a} + \frac{1}{b}$ 4) $\frac{1}{c^2} = \frac{1}{a^2} + \frac{1}{b^2}$

75. Match the following:

Circle	Centre
I. $x^2+y^2-4x+6y-11=0$	a)(3,4)
II. $x^2+y^2-6x-8y+12=0$	b)(-1,-1)
III.$x^2+y^2+2x+2y-5=0$	c)(2,-3)

1)a,b,c 2)b,c,a 3)c,a,b 4)a,c,b

76. A: The equation of the circle with centre(2,-3) and radius 5 is $x^2+y^2-4x+6y-12=0$.
R: The equation of the circle with centre(α,β) and radius r is $(x-\alpha)^2 +(y-\beta)^2 =r^2$.
1)Both A and R are true and r is the correct explanation of A.
2)Both A and R are true but R is not correct explanation of A
3)A is true but R is false 4)A is false but r is true

PREVIOUS EAMCET PROBLEMS

77. The equation of the circle passing through (2,1) and touching the coordinate axes is [EAMCET 91]
1)$x^2+y^2-2x-2y+1=0$ 2)$x^2+y^2+2x+2y+1=0$
3)$x^2+y^2-2x-2y-1=0$ 4)$x2+y^2+2x+2y-1=087$.

78. The locus of the points from which the lengths of the tangents to the two circles $x^2+y^2+4x+3=0$,$x^2+y^2-6x+5=0$ are in the ratio 2:3 is a circle with center
1)(6,0) 2)(-6,0) 3)(0,6) 4)(0-6) [EAMCET 93]

79. The centre and radius of the circle with the segment of the line x + y =1 cut of by the coordinate axes as diameter are
1)(1,1), √2 2)(1/2 ,½), √2 3)(1/2, ½), 1/√2 4)(0,0), 1 [EAMCET 95]

80. The equation of the tangent at (1,1) to the circle $2x^2+2y^2-2x-5y+3=0$ is
1)2x+y-1=0 2)2x-y-1=0 3)x+2y-1=0 4)2x+y+1=0 [EAMCET 96]

81. The radius of the circle which has the lines x+y-1=0 ,x+y-9=0 as tangents is
1)√2 2)2√2 3)3√2 4)4√2 [EAMCET 96]

82. The equation of the chord of the circle $x^2+y^2=25$ with (1,-1) as the mid point is
1)x+y=2 2)x+y+2=0 3)x-y=2 4)2x-y=2 [EAMCET 96]

83. Given that for the circle $x^2+y^2-4x+6y+1=0$, the line with equation $3x-y=1$ is a chord Themidpoint of the chord is [EAMCET 97]
1)(2/5,11/5) 2)(-25,11/4) 3)(-2/5,-11/5) 4)(2/5,-11/5)

84. The equation of the normal to the circle $x^2+y^2-2x-2y-2=0$ at (3,1) on it is
1)y+1=0 2)y+2=0 3)y=1 4)y=-1 [EAMCET 98]

85. The equation of a circle with centre(4,1) and having$3x+4y-1=0$ as tangent is[EAMCET98]
1)$x^2+y^2-8x-2y-8=0$ 2)$x^2+y^2-8x-2y+8=0$3)$x^2+y^2-8x+2y+8=0$ 4)$x^2+y^2-8x-2y+4=0$77

86. The inverse point of (1,-1) with respect to the circle $x^2+y^2=4$, is [EAMCET 99]
1)(-1,1) 2((-2,2) 3)(1,-1) 4)(2,-2)

87. The polar of the point (-2,3) w.r.t $x^2+y^2-4x-6y+5=0$ is
1)x=0 2)y=0 3)x=1 4)y=1 [EAMCET 96,99]

88. The slope m of a tangent through the point (7,1) to the circle $x^2+y^2=25$ satisfies the equation [2000]
1)$12m^2+7m-12=0$ 2)$12m^2+7m+9=0$ 3)$12m^2-7m-12=0$ 4)$9m^2+12m+16=0$

89. The centre of the circle touching the y-axis at (0,3) and making an intercept 2 unit on positive x-axis is [EAMCET 2000]
1)(10,√3) 2) (√3,10) 3) (√10,3) 4)(3, √10)

90. Variable circle passes through the fixed point (2,0) and touches the y-axis. Then the locus of its centre is
1)a parabola 2)a circle 3)an ellipse 4)a hyperbola [EAMCET 2000]

91. The equation of the normal to the circle $x^2+y^2+6x+4y-3=0$ at (1,-2) to is
1)y+1=0 2)y+2=0 3)y+3=0 4)y-2=0 [EAMCET 2001]

92. If the line $3x-2y+6=0$ meets X-axis and Y-axis respectively at A and B, then the equation of the circle with radius AB and centre at A is [EAMCET 2004]
1) $x^2+y^2+4x+9=0$ 2) $x^2+y^2+4x-9=0$ 3) $x^2+y^2+4x+4=0$ 4) $x^2+y^2+4x-4=0$

93. The number of circles that touches all the three lines $x+y-1=0$,$x-y-1=0$ and $y+1=0$is
1)2 2)3 3)4 4)1 [EAMCET 2004]

94. If (1,a),(b,2) are conjugate points with respect to the circle $x^2+y^2=25$, then $4a+2b=$
1)25 2)50s 3)100 4)150 [EAMCET 2004]

95. If P_1,P_2,P_3 are the perimeters of the three circles $x^2+y^2+8x-6y=0$, $4x^2+4y^2-4x-12y-186=0$ and $x^2+y^2-6x+6y-9=0$ respectively, then [EAMCET 2004]
1)$P_1<P_2<P_3$ 2)$P_1<P_3<P_2$ 3)$P_3<P_2<P_1$ 4)$P_2<P3<P1$

96. The equation of the circele whose diameter is the common chord of the circles $x^2+y^2+2x+3y+2=0$ and $x^2+y^2+2x-3y-4=0$ (2005)
1) $x^2+y^2+2x+2y+2=0$ 2) $x^2+y^2+2x+2y-1=0$
3) $x^2+y^2+2x+2y+1=0$ 4) $x^2+y^2+2x+2y+3=0$

97. If $y = 3x$ is a ta ngent to to circle with center (1,1) then the other tangent drawn through (0,0) to the circle is [2005]
1)3y = x 2)y =-3x 3)x-3y=0 4)x-3y =0

98. The length of the tangent drawn to the circle $x^2+y^2-2x+4y-11= 0$ from the point (1, 3) is
1)1 2)2 3)3 4)4 [2006]

99. Observe the following statements:
I. The circle $x^2+y^2-6x-4y-7=0$ touches y –axes.
II. The circle $x^2+y^2+6x+4y-7=0$ touches x-axes.
Which of the following is a correct statement? [2006]
1) Both I&II are true 2) Neither I nor II is true
3) I is true and II is false 4) I is false and II is true.

100. The equation of the circle of radius 3 that lies in the fourth quadrant and touching the lines x =0 and y =0 is [2007]
1) $x^2+y^2 -6x+6y+9 = 0$ 2) $x^2+y^2-6x-6y+9 = 0$
3)) $x^2+y^2+6x-6y +9= 0$ 4)) $x^2+y^2-6x+6y+9 = 0$

101. The inverse point of (1,2) with respect to the circle $x^2+y^2-4x-6y+9=0$ is [2007]
1)(0,0) 2) (1,0) 3) (0,1) 4) (1,1)

102. If the lines 2x-3y=5 and 3x-4y=7 are two diameters of a circle of radius 7then the equation of the circle is [2008]
1) $x^2+y^2+2x-4y -47= 0$ 2) $x^2+y^2= 49$
3) $x^2+y^2-2x+2y -49= 0$ 4) $x^2+y^2= 17$

103. The inverse of the point (1, 2) with respect to the circle $x^2+y^2 -4x-6y +9= 0$ is [2008]
1)(1,1/2) 2)(2,1) 3)(0,1) 4)(1,0)

104. The equation of the circles which pass through the origin and makes intercepts of lengths 4 and 8 on the x and y-axis respectively, are: [2009]
1) $x^2 +y^2 \pm 4x \pm 8y = 0$ 2) $x^2 +y^2 \pm 2x \pm 4y = 0$
3) $x^2 +y^2 \pm 8x \pm 16y = 0$ 4) $x^2 +y^2 \pm x \pm y = 0$

105. The locus of centre of a circle which passes through the origin and cuts off a length of 4 units from the line x = 3 is: [2009]
1) $y^2+6x=0$ 2) $y^2+6x=13$ 3) $y^2+6x=10$ 4) $y^2+6y=13$

106. The diameter of a circle are along 2x+y–7=0 and x+3y–11=0. Then the equation

of this circle, which also passes through (5, 7) is: [2009]

1) $x^2+y^2-4x-6y-16=0$ 2) $x^2+y^2-4x-6y-20=0$
3) $x^2+y^2-4x-6y-12=0$ 4) $x^2+y^2+4x-6y-12=0$

107. If the lengths of tangents drawn to the circle :

$x^2+y^2-8x+40=0$

$5x^2+5y^2-25x+80=0$

$x^2+y^2-8x+16y+160=0$

from the points P are equal, then P = [2010]

1) $\left(8,\frac{15}{2}\right)$ 2) $\left(-8,\frac{15}{2}\right)$ 3) $\left(8,\frac{-15}{2}\right)$ 4) $\left(-8,\frac{-15}{2}\right)$

108. The equation of the circle concentric with the circle $x^2+y^2-6x+12y+15=0$ and of double its area is : [2010]

1) $x^2+y^2-6x+12y+15=0$ 2) $x^2+y^2-6x+12y-30=0$
3) $x^2+y^2-6x+12y-25=0$ 4) $x^2+y^2-6x+12y-20=0$

109. If the line y = 2x + c is a tangent to the circle $x^2 + y^2 = 5$, then a value of c is [2011]

1) 2 2) 3 3) 4 4) 5

110. A line segment AM = α moves in the XOY plane such that AM is parallel to the X-axis. If A moves along the circle $x^2 + y^2 = a^2$, then the locus of M is [2011]

1) $x^2 + y^2 = 4a^2$ 2) $x^2 + y^2 = 2ax$
2) 3) $x^2 + y^2 = 2ay$ 4) $x^2 + y^2 = 2ax + 2ay$

111. If the lines 3x+4y–14=0 and 6x+8y+7=0 are both tangents to a circle, then its radius is [2011]

1) 7 2) $\frac{7}{2}$ 3) $\frac{7}{4}$ 4) $\frac{7}{6}$

112. Consider the circle $x^2 + y^2 - 4x - 2y + c = 0$ whose centre is A(2, 1). If the point P(10, 7) is such that the line segment PA meets the circle in Q with PQ = 5, then c = [2012]

1) – 15 2) 20 3) 30 4) – 20

113. If the line x + 3y = 0 is the tangent at (0, 0) to circle of radius 1, then the centre of one such circle is [2012]

1) $(3,0)$ 2) $\left(\frac{-1}{\sqrt{10}},\frac{-3}{\sqrt{10}}\right)$ 3) $\left(\frac{3}{\sqrt{10}},\frac{-3}{\sqrt{10}}\right)$ 4) $\left(\frac{1}{\sqrt{10}},\frac{3}{\sqrt{10}}\right)$

114. A circle passes through the point (3, 4) & cuts the circle $x^2+y^2=a^2$ orthogonally; the locus of its center is a straight line. If the distance of this straight line from the origin is 25, then a^2= [2012]

1) 250 2) 225 3) 100 4) 25

115. The circle $4x^2 + 4y^2 - 12x - 12y + 9 = 0$ [2013]

1) Touches both the axes
2) Touches the x – axis only
3) Touches the y – axis only
4) Does not touché the axes

116. For the circle C with the equation $x^2 + y^2 - 16x - 12y + 64 = 0$ match the list–I with the list– II given below:

List – I	List II
i) The equation of the polar of (-5,1) with respect to C	a) $y = 0$
ii) The equation of the tangent at (8, 0) to C	b) $y = 6$
iii) The equation of the normal at (2, 6) to C	c) $x + y = 7$
iv) The equation of the diameter of C through (8, 12)	d) $13x + 5y = 98$
	e) $x = 8$

The correct match is: [2013]

	i	ii	iii	iv		i	ii	iii	iv
1)	d	b	a	e	2)	d	a	b	e
3)	c	d	a	b	4)	c	e	b	a

117. If the length of the tangent from (h, k) to the circle $x^2 + y^2 = 16$ is twice the length of the tangent from the same point to the circle $x^2 + y^2 + 2x + 2y = 0$, then [2013]

1) $h^2 + k^2 + 4h + 4k + 16 = 0$
2) $h^2 + k^2 + 3h + 3k = 0$
3) $3h^2 + 3k^2 + 8h + 8k + 16 = 0$
4) $3h^2 + 3k^2 + 4h + 4k + 16 = 0$

118. A circle with centre at (2, 4) is such that the line $x + y + 2 = 0$ cuts a chord of length 6. The radius of the circle is (2014)

1) $\sqrt{11}$
2) $\sqrt{21}$
3) $\sqrt{31}$
4) $\sqrt{41}$

119. The point at which the circles $x^2 + y^2 - 4x - 4y + 7 = 0$ & $x^2 + y^2 - 4x - 4y + 7 = 0$ touch eachother is (2014)

1) $\left(\frac{2}{5}, \frac{5}{6}\right)$
2) $\left(\frac{14}{5}, \frac{13}{6}\right)$
3) $\left(\frac{12}{5}, 2 + \frac{\sqrt{21}}{5}\right)$
4) $\left(\frac{13}{5}, \frac{14}{5}\right)$

120. The condition for the lines $lx + my + n = 0$ & $l_1x + m_1y + n_1 = 0$ to be conjugate with respect to the circle $x^2 + y^2 = r^2$ is (2014)

1) $r^2(ll_1 - mm_1) = nn_1$
2) $r^2(ll_1 + mm_1) + nn_1 = 0$
3) $r^2(lm_1 + l_1m) = nn_1$
4) $r^2(ll_1 + mm_1) = nn_1$

121. The value of a such that the power of the point (1, 6) with respect to the circle $x^2 + y^2 + 4x - 6y - a = 0$ is (2015)

1) 7
2) 11
3) 13
4) 21

122. The area (in square units) of the triangle formed by the tangent, normal at $\left(1, \sqrt{3}\right)$ to the circle $x^2 + y^2 = 4$ & the X – axis is (2015)

1) $4\sqrt{3}$
2) $\frac{7}{2}\sqrt{3}$
3) $2\sqrt{3}$
4) $\frac{1}{2}\sqrt{3}$

123. If (4, 2) & (k, -3) conjugate points with respect to $x^2 + y^2 - 5x + 8y + 6 = 0$, then k = (2015)

1) $\frac{28}{3}$ 2) $-\frac{28}{3}$ 3) $\frac{3}{28}$ 4) $-\frac{3}{28}$

124. The sum of the minimum & maximum distance of the point (4, -3) to the circle $x^2 + y^2 + 4x - 10y - 7 = 0$ (2015 A.P)

1) 10 2) 12 3) 16 4) 20

125. The locus of centres of the circles which cut the circles $x^2 + y^2 + 4x - 6y + 9 = 0$ & $x^2 + y^2 - 5x + 4y + 2 = 0$ orthogonally is (2015 A.P)

1) $3x + 4y - 5 = 0$ 2) $9x - 10y + 7 = 0$
3) $9x + 10y - 7 = 0$ 4) $9x - 10y + 11 = 0$

126. The equation of the circle passing through (2, 0) & (0, 4) & having the minimum radius is (2015 A.P)

1) $x^2 + y^2 = 20$ 2) $x^2 + y^2 - 2x - 4y = 0$
3) $x^2 + y^2 = 4$ 4) $x^2 + y^2 = 16$

127. The point where the line $4x - 3y + 7 = 0$ touches the circle $x^2 + y^2 - 6x + 4y - 12 = 0$ is (2016)

1) (1, 1) 2) (1, -1) 3) (-1, 1) 4) (-1, -1)

128. The normal to the circle given by $x^2 + y^2 - 6x + 8y - 144 = 0$ at (8, 8) meets the circle again at the point (2016)

1) (2, -16) 2) (2, 16) 3) (-2, 16) 4) (-2, -16)

129. For all real values of k, the polar of the point (2k, k – 4) with respects to $x^2 + y^2 - 4x - 6y + 1 = 0$ passes through the point (2016)

1) (1, 1) 2) (1, -1) 3) (-3, 1) 4) (3, 1)

130. A circle S = 0 with radius $\sqrt{2}$ touches the line $x + y - z = 0$ at (1, 1). Then the length of the tangent drawn from the point (1, 2) to S = 0 is (2016AP)

1) 1 2) $\sqrt{2}$ 3) $\sqrt{3}$ 4) 2

131. The normal drawn at P(-1, 2) on the circle $x^2 + y^2 - 2x - 2y - 3 = 0$ meets the circle at another point Q. Then the coordinates of Q are (2016AP)

1) (3, 0) 2) (-3, 0) 3) (2,0) 4) (-2, 0)

132. If the lines $kx + 2y - 4 = 0$ & $5x - 2y - 4 = 0$ are conjugate with respect to the circle $x^2+y^2-2x-2y+1=0$, then k = (2016AP)

1) 0 2) 1 3) 2 4) 3

133. If the slope of the tangent to the circle $S = x^2 + y^2 - 13 = 0$ at (2, 3) is m, then the point $\left(m, \frac{-1}{m}\right)$ is (2017)

1) An external point with respect to the circle S = 0
2) An internal point with respect to the circle S = 0
3) The centre of the circle S = 0
4) A point on the circle S = 0

134. Let the tangents drawn from P(-1, -1) to the circle $x^2 + y^2 - 2x - 4y - 4 = 0$ touch the circle at the points A & B. Then the area of the triangle PAB is (2017AP)

1) $\frac{24}{13}$ 2) $\frac{24}{7}$ 3) $\frac{8}{13}$ 4) $\frac{3}{13}4^{2/3}$

135. If the chord of contact of $P(x_1, y_1)$ with respect to the circle $x^2 + y^2 = a^2$ meets the circle at A & B, & if $\angle AOB = 90^0$, then $x_1^2 + y_1^2 =$ (2017AP)

1) a^2 2) $2a^2$ 3) $3a^2$ 4) $4a^2$

136. The point of concurrence of the polars of the variable point (2t, t – 4), $t \in R$ with respect to the circle $x^2 + y^2 - 4x - 6y + 1 = 0$ is (2017AP)

1) (1, 3) 2) (1, -3) 3) (-3, 1) 4) (1, -2)

137. The radical centre of the circles $x^2 + y^2 - 4x - 6y + 5 = 0$, $x^2 + y^2 - 2x - 4y - 1 = 0$, $x^2 + y^2 - 6x - 2y = 0$ lies on the line (2017)

1) $x + y - 5 = 0$ 2) $2x - 4y + 7 = 0$
3) $4x - 6y + 5 = 0$ 4) $18x - 12y + 1 = 0$

138. A point which lies on the circle passing through the points (1, 1), (-6, 0), (-2, 2) is

1) (1, -6) 2) (9, 1) 3) (-2, -8) 4) (1, 2)

KEY

1) 2	2) 4	3) 1	4) 1	5) 4	6) 2	7) 2	8) 1	9) 3	10) 4
11) 1	12) 1	13) 2	14) 1	15) 2	16) 3	17) 3	18) 2	19) 1	20) 2
21) 1	22) 1	23) 4	24) 2	25) 2	26) 2	27) 1	28) 3	29) 4	30) 4
31) 1	32) 3	33) 2	34) 4	35) 13	36) 2	37) 2	38) 1	39) 3	40) 4
41) 2	42) 1	43) 2	44) 2	45) 2	46) 4	47) 2	48) 1	49) 2	50) 1
51) 1	52) 4	53) 2	54)	55)	56)	57)	58)	59)	60)
61)	62)	63)	64)	65)	66) 1	67) 2	68) 3	69) 1	70) 1
71) 1	72) 3	73) 2	74) 4	75) 3	76) 1	77) 1	78) 2	79) 3	80) 2
81) 2	82) 3	83) 3	84) 3	85) 2	86) 4	87) 1	88) 3	89) 3	90) 1
91) 2	92) 2	93) 3	94) 2	95) 2	96) 3	97) 1	98) 3	99) 2	100) 4
101) 3	102) 3	103) 3	104) 1	105) 2	106) 3	107) 3	108) 1	109) 4	110) 2
111) 2	112) 4	113) 4	114) 2	115) 1	116) 2	117) 3	118) 4	119) 2	120) 4
121) 4	122) 3	123) 1	124) 4	125) 2	126) 2	127) 3	128) 4	129) 4	130) 3
131) 1	132) 1	133) 2	134) 1	135) 2	136) 4	137) 4	138) 3	139)	140)

Exercise-B

1. The abscissae of two points A,B are roots of $x^2+4x-45=0$ and ordinates of A,B are roots of $y^2-7y+12=0$ then centre of the circle for which AB is diameter is
1)(2,7/2) 2)(4,-7) 3)(-2,7/2) 4)(-2,-7/2)

2. If the circle described on the line joining the points (0,1) and (α,β) as diameter cuts the axis of X at the points whose abscissae are roots of the equation $x^2-5x+3=0$ then $(\alpha,\beta)=$
1)(3,5) 2)(-3,-5) 3)(5,3) 4)(-5,3)

3. Origin is the centre of the circle which circumscribes an equilateral triangle. The lengthof a median of this triangle is 3a. Then the equation of the circle is
1)$x^2+y^2=a^2$ 2)$x^2+y^2=4a^2$ 3)$x^2+y^2=9a^2$ 4)$x^2+y^2=9a^2/4$

4. If an equilateral triangle inscribed in the circle $x^2+y^2=a^2$, the length of each side is
1) $\sqrt{3}/2a$ 2) $\sqrt{3}a$ 3)$2a/\sqrt{3}$ 4)$a/\sqrt{3}$

5. The locus of poles of tangents of the circle $x^2+y^2=a^2$ w.r.t the circle $x^2+y^2-2ax-a^2=0$ is given by
1)$y^2=4ax$ 2)$y^2+ax=0$ 3)$y^2+4ax=0$ 4)$y^2-ax=0$

6. The equation of the circle passing through Y-axis at origin and passing through (b,c) is
1)$b(x^2+y^2)=(b^2+c^2)x$ 2) $c(x^2+y^2)=(b^2+c^2)y$
3) $b(x^2+y^2)=(b^2+c^2)y$ 4)$c(x^2+y^2)=(b^2+c^2)y$

7. A variable circle passes through the fixed point A(p,q) and touches x-axis. The locus of the other end of the diameter through A is
1)$(x-p)^2=4qy$ 2)$(y-q)^2=4px$ 3)$(y-p)^2=4qx$
4)$(x-q)^2=4py$

8. The equation of the circle passing through (2,1) and touching the coordinate axes is
1)$x^2+y^2-2x-2y+1=0$ 2)$x^2+y^2+2x+2y+1=0$
3)$x^2+y^2-2x-2y-1=0$ 4)$x2+y^2+2x+2y-1=087$.

9. The locus of the points from which the lengths of the tangents to the two circles $x^2+y^2+4x+3=0, x^2+y^2-6x+5=0$ are in the ratio 2:3 is a circle with center
1)(6,0) 2)(-6,0) 3)(0,6) 4)(0-6)

10. The centre and radius of the circle with the segment of the line x + y =1 cut of by the coordinate axes as diameter are

1)(1,1), $\sqrt{2}$ 2)(1/2 ,½), $\sqrt{2}$ 3) (1/2, 1/2), $1/\sqrt{2}$ 4)(0,0), 1

11. The equation of the tangent at (1,1) to the circle $2x^2+2y^2-2x-5y+3=0$ is
1)2x+y-1=0 2)2x-y-1=0 3)x+2y-1=0 4)2x+y+1=0

12. The radius of the circle which has the lines x+y-1=0 ,x+y-9=0 as tangents is
1)$\sqrt{2}$ 2)$2\sqrt{2}$ 3)$3\sqrt{2}$ 4)$4\sqrt{2}$

13. The equation of the chord of the circle $x^2+y^2=25$ with (1,-1) as the mid point is
1)x+y=2 2)x+y+2=0 3)x-y=2 4)2x-y=2

14. Given that for the circle $x^2+y^2-4x+6y+1=0$, the line with equation 3x-y=1 is a chord The midpoint of the chord is
1)(2/5,11/5) 2)(-25,11/4) 3)(-2/5,-11/5) 4)(2/5,-11/5)

15. The equation of the normal to the circle $x^2+y^2-2x-2y-2=0$ at (3,1) on it is
1)y+1=0 2)y+2=0 3)y=1 4)y=-1

16. The equation of a circle with centre(4,1) and having3x+4y-1=0 as tangent is
1)$x^2+y^2-8x-2y-8=0$ 2)$x^2+y^2-8x-2y+8=0$
3)$x^2+y^2-8x+2y+8=0$ 4)$x^2+y^2-8x-2y+4=077$

17. The inverse point of (1,-1) with respect to the circle $x^2+y^2=4$, is
1)(-1,1) 2((-2,2) 3)(1,-1) 4)(2,-2)

18. The polar of the point (-2,3) w.r.t $x^2+y^2-4x-6y+5=0$ is
1)x=0 2)y=0 3)x=1 4)y=1

19. The slope m of a tangent through the point (7,1) to the circle $x^2+y^2=25$ satisfies the equation
1)$12m^2+7m-12=0$ 2)$12m^2+7m+9=0$ 3)$12m^2-7m-12=0$ 4)$9m^2+12m+16=0$

20. The centre of the circle touching the y-axis at (0,3) and making an intercept 2 unit on positive x-axis is
1)(10,$\sqrt{3}$) 2) ($\sqrt{3}$,10) 3) ($\sqrt{10}$,3) 4)(3, $\sqrt{10}$)

21. Variable circle passes through the fixed point (2,0) and touches the y-axis. Then the locus of its centre is
1)a parabola 2)a circle 3)an ellipse 4)a hyperbola

22. The equation of the normal to the circle $x^2+y^2+6x+4y-3=0$ at (1,-2) to is
1)y+1=0 2)y+2=0 3)y+3=0 4)y-2=0

23. If the line 3x-2y+6=0 meets X-axis and Y-axis respectively at A and B, then the equation of the circle with radius AB and centre at A is
1) $x^2+y^2+4x+9=0$ 2) $x^2+y^2+4x-9=0$ 3) $x^2+y^2+4x+4=0$ 4) $x^2+y^2+4x-4=0$

24. The number of circles that touches all the three lines x+y-1=0,x-y-1=0 and y+1=0is
1)2 2)3 3)4 4)1

25. If (1,a),(b,2) are conjugate points with respect to the circle $x^2+y^2=25$, then 4a+2b=
1)25 2)50s 3)100 4)150

26. If P_1,P_2,P_3 are the perimeters of the three circles $x^2+y^2+8x-6y=0$, $4x^2+4y^2-4x-12y-186=0$ and $x^2+y^2-6x+6y-9=0$ respectively, then
1)$P_1<P_2<P_3$ 2)$P_1<P_3<P_2$ 3)$P_3<P_2<P_1$ 4)$P_2<P3<P1$

27. The equation of the circele whose diameter is the common chord of the circles $x^{2+}y^{2+}2x+3y+2=0$ and $x^{2+}y^{2+}2x-3y-4=0$
1) $x^2+y^2+2x+2y+2=0$ 2) $x^2+y^2+2x+2y-1=0$
3) $x^2+y^2+2x+2y+1=0$ 4) $x^2+y^2+2x+2y+3=0$

28. If $y = 3x$ is a ta ngent to to circle with center (1,1) then the other tangent drawn through (0,0) to the circle is
1)3y = x 2)y =-3x 3)x-3y=0 4)x-3y =0

29. Observe the following statements :
I. The circle $x^2+y^2-6x-4y-7=0$ touches y –axes.
II. The circle $x^2+y^2+6x+4y-7=0$ touches x-axes.
Which of the following is a correct statement?
1)Both I&II are true 2)Neither I nor II is true
3)I is true and II is false 4) I is false and II is true.

KEY

1) 3	2) 3	3) 2	4) 2	5) 1	6) 1	7) 1	8) 1	9) 2	10) 3
11) 2	12) 2	13) 3	14) 3	15) 3	16) 2	17) 4	18) 1	19) 3	20) 3
21) 1	22) 2	23) 2	24) 3	25) 2	26) 2	27) 3	28) 1	29) 2	

AIEEE PROBLEMS

1. The lines 2x – 3y = 5 and 3x – 4y = 7 are two diameters of a circle of area 154 sq. units. Then the equation of this circle is [2003]
1) $x^2 + y^2+2x-2y-62=0$ 2) $x^2+y^2-2x+2y-47=0$
3) $x^2+y^2-12x-2y-47=0$ 4)$x^2+y^2-2x+2y-62=0$

2. A variable circles passes through the fixed point *A (p, q)* and touches x – axis. The locus of the other end of the diameter through A is [2004]
1) $(x – p)^2 = 4qy$ 2) $(x – p)^2=4px$ 3) $(y – p)^2 = 4qx$ 4) $(x–q)^2=4py$

3. If the lines 2x + 3y + 1 = 0 and 3x – y – 4 = 0 lie along diameters of a circle of circumferences 10π , then the equation of the circle is [2004]
1) $x^2 + y^2 - 2x + 2y -23 = 0$ 2) $x^2 + y^2 +2x – 23 = 0$

3) $x^2 + y^2 + 2x + 2y - 23 = 0$ 4) $x^2 + y^2 - 2x - 2y - 23 = 0$

4. If the lines $3x - 4y - 7 = 0$ and $2x - 3y - 5 = 0$ are two diameters of a circle of area 49π square units, the equation of the circle is [2006]
1) $x^2 + y^2 - 2x + 2y - 62 = 0$ 2) $x^2 + y^2 - 2x + 2y - 47 = 0$
3) $x^2 + y^2 + 2x - 2y - 47 = 0$ 4) $x^2 + y^2 + 2x - 2y - 62 = 0$

5. Let C be the circle with centre (0, 0) and radius 3 units. The equation of the locus of the midpoints of the chords of the circle C that subtends an angle of $2\pi/3$ at its centre is [2006]
1) $x^2 + y^2 = 27/4$ 2) $x^2 + y^2 = 9/4$ 3) $x^2 + y^2 = 3/2$ 4) $x^2 + y^2 = 1$

6. Consider a family of circles which are passing through the point (-1, 1) and are tangent to x – axis. If (h, k) are the co – ordinate of the centre of the circles, then the set of values of *K* is given by the interval [2007]
1) $0 < k < \frac{1}{2}$ 2) $k \geq \frac{1}{2}$ 3) $\frac{-1}{2} k \geq \frac{1}{2}$ 4) $k \leq \frac{1}{2}$

KEYS

1) 2	2) 1	3) 1	4) 2	5) 2	6) 2

12. SYSTEM OF CIRCLES

1. A set of circles is said to be a system of circles if it contains atleast two circles.

2. Let $S=0$, $S'=0$ are two circles having radii r_1, r_2 and distance between centres is d
   i) If $d=r_1+r_2$ circles touch each other externally
   ii) If $d>r_1+r_2$ circles do not touch each other
   iii) If $d=|r_1-r_2|$ circles touch each other internally
   iv) If $d<r_1+r_2$ circles intersect each other
   v) If $d=0$ concentric circles
   vi) If $d<|r_1-r_2|$ one circles completely lies inside the other circles.

3. If two circles $S=0$ & $S'=0$ intersect at $'p'$, then the angle between the tangents of the two circles at p is called the angle between the circles at p.

4. If 'd' is the distance between the centres of two intersecting circles with radii r_1,r_2 and ' θ' is the angle between the circles then
   $$\cos\theta = \frac{d^2-r_1^2-r_2^2}{2r_1r_2}$$

5. If 'θ' is the angle between the circles
   $S=x^2+y^2+2gx+2fy+c=0$ &
   $S=x^2+y^2+2g'x+sf'y+c'=0$
   then $\cos\theta = \dfrac{(c+c')-2(gg+ff')}{2\sqrt{g^2+f^2-c}\ \sqrt{g'^2+f'^2-c'}}$

6. The condition that the two circles
   $S=x^2+y^2+2gx+2fy+c=0$ &
   $S=x^2+y^2+2g'x+2f'y+c=0$ may cut each other orthogonally is
   $2gg'+2ff'=c+c'$

7. The point of intersection of direct common tangents of two circles is called as external centre of similitude.
   If r_1,r_2 are radii of circles c_1 and c_2 then external centre of similitude divide the line joining c_1,c_2 in the ratio $r_1 : r_2$ externally.

8. The point of intersection of transverse common tangents of two circles is called as internal centre of similitude
   If r_1,r_2 are radii of circles c_1 and c_2 then internal centre of similitude divides the line joining c_1,c_2 in the ratio $r_1:r_2$ internally.
9. If the radii of two circles are equal then the external centre of similitude does not exist.

10. If two circles are given then the locus of the points whose powers with respect to these two circles are equal is called as radical axis of these two circles.

(or)

The locus of points whose length of tangents to these circle are equal.

11. If S=0, S′=0 are two circles in standard form then equation of radical axis is S-S′=0
    a) R.A is a straight line.
    b) If two circles intersect in A and B, then their common chord is R.A i.e AB is R.A.
    c) If two circles touch each other, then the common tangent at the point of contat is R.A.
    d) The minimum number of R.A is zero when two circles are concentric
    e) If one circle lie in the other , then radical axis lies outside of the both the circles.

12. If centres of three circles are non-collinear, then the point of concurrence of the three R.A is called a Radical centre(R.C)
    i. Only when R.C lies outside the three circles, we can have a circle cutting the three given circles orthogonally.
    ii. If radical center lies out side of a circle then it lies out side of all the three circles.
    iii. If radical center lies on a circle then it lies on the all the circles i.e, at the point from which all the circles passes (intersect).

13. If in a system of circles, each pair of circles have the same R.A then the system is called as a co-axial system of circles Here R.A being common to all the circles, it is called common R.A of the system.
    i. For a coxal system of circles centers of the of all the circles are collinear.
    ii. The line joining center is called the line of centers.
    iii. Common radical axis is perpendicular to the line of centres.

14. Simplest form of co-axial system of circles is $x^2+y^2+2\lambda x+c=0$ (λ parameter, c is a constant).

15. The point circles of a Co-axial system of circles are called as limiting points of that co-axal system
    a) limiting points lie on the line of centres.
    b) Common Radical axis is the perpendicular bisector of the segment joining limiting points. Here one limiting point is image of the other limiting point w.r.t common Radical axis.
    c) If $x^2+y^2+2\lambda x+c=0$ is a co-axal system of circles then the limiting point are $(\pm\sqrt{c},0)$
       $\therefore$ $c > 0 \Rightarrow$ two limiting points
       $c = 0 \Rightarrow$ one limiting point it is (0,0)
       $c < 0 \Rightarrow$ no limiting point
    d) limiting point are a pair of conjugate points with respect to every member of the co-axal system

Conjugate co-axal system (or) Orthogonal co-axal system of circles:
In two co-axal systems, if every member of one system cuts every member of the other co-axal system orthogonallyt hen the two co-axal systems are called as conjugate co-axal systems to each other.

EXERCISE-A

1. The angle at which the circles $x^2 + y^2 = 4$ and $x^2 + y^2 - 2x - 2y = 0$ intersect is
   1) $\frac{3\pi}{4}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{2}$

2. If the circles $x^2 + y^2 - 2kx - 2y - 7 = 0$ and $3x^2 + 3y^2 - 8x + 29y = 0$ cut orthogonally then $k =$
   1)-1 2)1 3)0 4)2

3. The length of the common chord of circles $x^2 + y^2 + 2x + 3y + 1 = 0$ and $x^2 + y^2 + 4x + 3y + 2 = 0$ is
   1) $\sqrt{2}$ 2) $2\sqrt{2}$ 3)3 4) $\frac{3}{2}$

4. The length of the common chord of the circles $x^2 + y^2 - 2x - 2 = 0$ and $x^2 + y^2 - 5x - 6y + 4 = 0$ is
   1) $\sqrt{\frac{14}{5}}$ 2) $2\sqrt{\frac{14}{5}}$ 3) $\frac{2\sqrt{14}}{5}$ 4) $\frac{\sqrt{14}}{5}$

6. The angle at which the circles $x^2+y^2-12x-6y+41=0$ and $x^2+y^2+4x+6y-59=0$ intersect is
   1) $\Pi/2$ 2) $\Pi/4$ 3) $\Pi/3$ 4) $\Pi/2$

7. The angle which the circles $x^2+y^2=4$ and $x^2+y^2-2x-2y=0$ intersect is
   1)$3\Pi/4$ 2) $\Pi/3$ 3) $\Pi/4$ 4) $\Pi/2$

8. The angle at which the circles $x^2+y^2-2x+4y+4=0$ and $x^2+y^2+3x+4y+1=0$ intersect is
   1)$\Pi/4$ 2) $\Pi/3$ 3) $\Pi/2$ 4) $3\Pi/5$

9 If the circles $x^2+y^2-2kx-2y-7=0$ and $3x^2+3y^2-8x+29y=0$ cut orthogonally then k=
   1)-1 2)1 3) 0 4)2

10. If the circles $x^2+y^2+2x+17x+k=0$;$x^2+y^2-6x-4y-44 =0$ cut orthogonally then k=
   1) -1 2)1 3) 0 4) 4

11. The angle between the circles $x^2+y^2+6x-10y-135=0$ and $x^2+y^2-4x+14y-116 = 0$

is

1) $\Pi/2$ 2) $\Pi/6$ 3) $2\Pi/3$ 4) $\Pi/4$

12. If the circles $x^2+y^2+4x+ky+8=0$ and $x^2+y^2+6x-8y-20=0$ intersect orthogonally, k=

1) 6 2) -8 3)-6 4) 8

13. The equation of the common chord of the circles $x^2+y^2-2x+1=0$ and $x^2+y^2-5x-6y+4=0$ is

1)3x+6y+5=0 2) x+2y-1=0 3) x-2y-1=0 4) x+2y+1=0

14. If the circles $x^2+y^2-2x-4y-20=0$ $x^2+y^2+6x+2y-90=0$ are touching each other, then the equation of the common tangent at the point of contact is

1)4x+3y-35=0 2) 4x+3y+35=0 3) 4x+3y-50 =0 4) 4x-3y-50 =0

15. The equation of the radical axis of the circles $x^2+y^2+8x+4y-5=0$ and $2x^2+2y^2-3x+5y+2=0$ is

1) 19x+3y-8=0 2) 19x+3y-12=0 3) 19x+3y-6=0 4) 19x+3y-4=0

16. If P and Q are conjugate points with respect to the circle S=0, Then the circle with PQ as diameter cuts S=0 at an angle of

1)45^0 2) 75^0 3)90^0 4) 60^0

17. If a and a‘ are radii of the circles S=0 and S‘=0 respectively, then the angle between the circles S/a+S‘/a‘ =0 and S/a-S‘/a‘ =0 is

1)90^0 2) 45^0 3) 60^0 4)120^0

18. The length of the common chord of circles $x^2+y^2+2x+3y+1=0$ and $x^2+y^2+4x+3y+2=0$ is

1)$\sqrt{2}$ 2) $2\sqrt{2}$ 3) 3 4) 3/2

19. The length of the common chord of the circles $x^2+y^2-2x-2=0$ and $x^2+y^2-5x6y+4=0$ is

1) $\sqrt{\frac{14}{5}}$ 2) $2\sqrt{\frac{14}{5}}$ 3) $2\frac{\sqrt{14}}{5}$ 4) $\frac{\sqrt{14}}{5}$

20. The radical axis of the circles $3x^2+3y^2-2x+3y+1=0$ and $x^2+y^2-2y+1=0$

1)$2x^2+2y^2-6x+5y-2=0$ 2) 2x-9y+2=0 3) 10x-11y+4=0 4) 3x+y=0

21. The circle passing through (0,0) and cutting $x^2+y^2-4x+6y+10=0$ and $x^2+y^2+12y+6=0$ orthogonally is

1)$x^2+y^2-7x+2y=0$ 2) $2(x^2+y^2)-7x+y=0$

3) $4(x^2+y^2)-7x+4y=0$ 4) $2(x^2+y^2)-7x+2y=0$

22. The circle which cuts x2+y2-4x+2y+4 =0 orthogonally passing through (0,0) and having its centre on x+y=4 is
1) $x^2+y^2-6x-2y=0$ 2) $x^2+y^2-2x-6y=0$ 3) $x^2+y^2-4x-4y=0$ 4) $x^2+y^2+2x+8y=0$

23. Equation of the circle cutting the circles $x^2+y^2=a^2, x^2+(y-b)^2=a^2$ and $(x-c)^2+y^2=a^2$ orthogonally is
1) $x^2+y^2-cx-by-a^2=0$ 2) $x^2+y^2+cx+by+a^2=0$
3) $x^2+y^2+cx-by+a^2=0$ 4) $x^2+y^2-cx-by+a^2=0$

24. Equation of the circle cutting circles $x^2+y^2+a_1x+b_1y+c=0$, $x^2+y^2+a_2x+b_2y+c=0$ and $x^2+y^2+a_3x+b_3y+c=0$ orthogonally is
1)$x^2+y^2=c^2$ 2) $x^2+y^2=c/2$ 3) $x^2+y^2=2c$ 4) $x^2+y^2=c$

25. The equation of the circle through the points of intersection of the circles $x^2+y^2+4x-6y-12=0$ and $x^2+y^2+6x+4y-12$ and cutting the circle $x^2+y^2-2y+3=0$ orthogonally is
1) $x^2+y^2+7x+9y-12=0$ 2) $x^2+y^2-7x+9y-12=0$
3) $x^2+y^2-7x-9y-12=0$ 4) $x^2+y^2-7x+9y+12=0$

26. The radical centre of the three circles $x^2+y^2=1$, $x^2+y^2-2x-3=0$ and $x^2+y^2-2y-3=0$ is
1) (-1,-1) 2) (2,2) 3) (3,3) 4) (0,0)

27. The radical centre of the circles $x^2+y^2-2x+6y=0$, $x^2+y^2-4x-2y+6=0$ and $x^2+y^2-x+2y+3=0$ is
1)(0,3/4) 2)(-3,0) 3) (3,0) 4) (0,-3)

28. The radical centre of the circles $x^2+y^2+2x+4y+1=0, 2x^2+2y^2+6x+8y-3=0$ and $x^2+y^2-2x-6y-3=0$ is
1)(5/2,7/2) 2)(5/2,-7/2) 3)(-5/2, 7/5) 4) (5/2,-7/5)

29. The radical centre of the circles $x^2+y^2+2x+17y+4=0, x^2+y^2+7x+6y+11=0$ and $x^2+y^2-x+22y+3=0$ is
1) (-2,-1) 2) (2,3) 3) (3,2) 4) (-3,-2)

30. If the circle $x^2+y^2+2gx+2fy+c=0$ bisects the circumference of $x^2+y^2+2g_1x+2f_1y+c_1=0$, then $2g_1(g-g_1)+2f_1(f-f_1)=$
1)$c+c_1$ 2) $c-c_1$ 3) $(c-c_1)/2$ 4) $(c+c_1)/2$

31. The chord common to $x^2+y^2-6x-4y+9=0$ and $x^2+y^2-8x-6y+23=0$ is the diameter of which of the following circles

1) $x^2+y^2-8x-6y+23=0$ 2) $x^2+y^2-6x-4y+9=0$

3) $x^2+y^2+8x+6y-23=0$ 4) $x^2+y^2+6x+4y-9=0$

32. The equation of the circle co-axal with $x^2+y^2-6x+4y-8=0$ and $x^2+y^2+2x+y+4=0$ and passing through (0,0) is

1)$3x^2+3y^2+2x+6y=0$ 2) $3x^2+2y^2-2x-6y=0$

3) $3x^2+3y^2-2x+6y=0$ 4) $3x^2+3y^2+2x-6y=0$

33. The equation of the circle co-axal with $x^2+x^2+y^2+8x-6y=0$ and $x^2+y^2-3x+2y-1=0$ and passing through (-1,-2) is

1)$2x^2+2y^2-17x+12y-3=0$ 2)$2x^2+2y^2-17x+12y+3=0$

3)$2x^2+2y^2+17x+12y-3=0$ 4)$2x^2+2y^2+17x-12y-3=0$

34. The equation of a circle co-axal with $x^2+y^2+10x-4y-1=0$ $x^2+y^2+5x+y+4=0$ are touching the y-axes is

1)$x^2+y^2-8x+2y+1=0$ 2)$x^2+y^2-6x+9=0$

3)$x^2+y^2+8x+2y+1=0$ 4)$x^2+y^2+8x-2y+1=0$

35 The circle with AB as diameter where A and B are the intersection points of $x^2+y^2=a^2$ and $x\cos\alpha+y\sin\alpha=p$ is

1)$x^2+y^2-a^2+2p(x\cos\alpha+y\sin\alpha)=0$ 2) $x^2+y^2-a^2-p(x\cos\alpha+y\sin\alpha-p)=0$

3)$x^2+y^2-a^2-2p(x\cos\alpha+y\sin\alpha-p)=0$ 4) $x^2+y^2-p(x\cos\alpha+y\sin\alpha-p)=0$

36. If (1,-1) and (2,0) are the limiting points of a co-axal system then the member of the system which pass through (0,0) is

1)$x^2+y^2+4x=0$ 2) $x^2+y^2+4x+4y=0$ 3) $x^2+y^2-4y=0$ 4) $x^2+y^2+4y=0$

37. If (1,3) and (2,6) are the limiting points of a co-axal system, then the member of the system which pass through (0,0) is

1)$3x^2+3y^2+4x+12y=0$ 2) $3x^2+3y^2+4x-12y=0$

3) $3x^2+3y^2-4x+12y=0$ 4) $3x^2+3y^2-4x-12y=0$

38. The radical centre of the three circles $x^2+y^2=1, x^2+y^2-2x-3=0$ and $x^2+y^2-5y-3=0$ is

1)$\left(0,\frac{3}{4}\right)$ 2)(-3.0) 3)(3,0) 4)(0,-3)

39. The equation of the circle co-axal with $x^2+y^2-6x+4y-8=0$ and $x^2+y^2+2x+y+4=0$ and passing through (0,0) is

1) $3x^2+3y^2+2x+6y=0$ 2) $3x^2+3y^2-2x-6y=0$

3) $3x^2 + 3y^2 - 2x + 6y = 0$ 4) $3x^2 + 3y^2 + 2x - 6y = 0$

40 The equation of the circle co-axal with $x^2 + y^2 + 8x - 6y = 0$ and $x^2 + y^2 - 3x + 2y - 1 = 0$ and passing through (-1,-2) is

1) $2x^2 + 2y^2 - 17x + 12y - 3 = 0$ 2) $2x^2 + 2y^2 - 17x + 12y + 3 = 0$

3) $2x^2 + 2y^2 + 17x + 12y - 3 = 0$ 4) $2x^2 + 2y^2 + 17x - 12y - 3 = 0$

41. If (1,2) is a limiting point of a co-axal system for which the radical axis is 3x+y-10=0 then the other limiting point is

1) (3,4) 2) (4,3) 3) (-3,-4) 4) (-1,-2)

42 If (-2,-1) is a limiting point of a co-axal system for which x-y-1 =0 is the radical axis, then the other limiting point is

1)(-4,1) 2) (0,3) 3) (0,-3) 4) (4-1)

43. If (1,2) is a limiting point of a co-axal system in which $x^2+y^2+2x-6y=0$ is a member, then the other limiting point is

1)(-5,5) 2) (3,1) 3) (3,2) 4) (5-5)

44. If (1,3) is a limiting point of a co-axal system in which $x^2+y^2-4y=0$ is a member , then the other limiting point is

1)(2,4) 2) (2,6) 3)(4,2) 4) (6,2)

45. If (3,5) is a limiting point of a co-axal system for which $x^2+y^2+2x-24=0$ is a member, then the other limiting point is

1)(1,2) 2) (-3,-4) 3) (3,4) 4) (-1,-2)

46. A circle passing through the limiting points of a given co-axal system cuts any member of the system at an angle of

1)45^0 2) 90^0 3) 60^0 4) 30^0

47. IF(0,0) is a limiting point of a co-axal system for which S=0 is a member, then the other limiting point is

1) [gc / (g^2+f^2 , fc / g^2+f^2] 2) [-gc / (g^2+f^2 , fc / g^2+f^2]

3) [-gc / (g^2+f^2 , -fc / g^2+f^2] 4) 1) [gc / (g^2+f^2 , -fc / g^2+f^2]

48. If (0,0) is a limiting point of a co-axal system for which $x^2+y^2+2x+2y+4=0$ is a member , then the other limiting point is

1)(1,1) 2) (-1,-1) 3) (2,2) 4) (-2,-2)

49. The number of common tangents that can be drawn to the circles $x^2+y^2-4x+6y+8=0$, $x^2+y^2-10x-6y+14=0$ is

1)1 2)2 3)3 4)4

50. The radical centre of the circles $x^2+y^2-2x+6y=0$,$x^2+y^2-4x-2y+6=0$,x^2+y^2-

$12x+12y+30=0$ is
1)(3,1) 2)(3,0) 3)(1,3) 4)(0,3)

51. The equation of the circle with centre (-1,1) and touching the circle $x^2+y^2-4x+6y-3=0$ externally is
1)$x^2+y^2+2x-2y+1=0$ 2)$2x^2+2y^2+12x-2y+1=0$
3)$x^2+y^2+2x+12y-11=0$ 4)$3x^2+3y^2+20x-21y+1=0$

52. The equation of the circle whose radius is 5 and which touches the circle $x^2+y^2-2x-4y-20=0$ at the4 point (5,5)
1)$x^2+y^2-18x-16y+120=0$ 2)$x^2+y^2+18x+16y-120=0$
3)$x^2+y^2-18x-16y-120=0$ 4)$x^2+y^{20}+18x+16y+120=0$

53. If the circle $x^2+y^2-6x-8y+12=0, x^2+y^2-4x+6y+k=0$ cut orthogonally, then k =
1)-24 2)24 3)12 4)15

54. If the circles $x^2+y^2+2ax+8=0$, $x^2+y^2+4by-k=0$ cut orthogonally, then k=
1)-24 2)24 3)8 4)-8

55. The external centre of similitude of the two circles $(x-2)^2+(y-1)^2=9$, $(x+3)^2+(y-1)^2=4$ is
1)(-13,1) 2)(22,-4) 3)(2,6) 4)(6,10)

56. The equations to the direct common tangents to the circles $x^2+y^2+6x+4y+4=0, x^2+y^2-2x=0$ is
1)$y-1=0, 2x-5y-19=0$ 2)$y-1=0, -3y-9=0$
3)$y+1=0, 4x+3y+9=0$ 4)$y+5=0, 2x-2y-25=0$

57. The limiting points of the coaxal system $x^2+y^2+11x-5y-2+\lambda(x-y-1)=0$ is
1)(-2,-1),(0,-3) 2)(2,1),(-5,-6) 3)(2,1),(0,3) 4)(5,2),(5,6)

58. One limiting point of the coaxal system of circles containing $x^2+y^2-6x-6y+4=0$ and $x^2+y^2-2x-4y+3=0$ is
1)(-1,1) 2)(-1,2) 3)(-2,1) 4)(-2,2)

59. If a circle passes through the point (a, b) and cuts the circle $x^2+y^2=4$ orthogonally, then the locus of its centre is
1)$2ax+2by+(a^2+b^2+4)=0$ 2)$2ax-2by-(a^2+b^2+4)=0$
3)$2ax-2by+(a^2+b^2+4)=0$ 4)$2ax+2by-(a^2+b^2+4)=0$

60. If the two circles $(x-1)^2+(y-3)^2=r^2$ and $x^2+y^2-8x+2y+8=0$ intersect in two distinct Points, then
1)$r<2$ 2)$r=2$ 3)$r>2$ 4)$2<r<8$

61 The radical centre of the circles $x^2+y^2=1, x^2+y^2-2x=1, x^2+y^2-2y=1$ is
1)(0,0) 2)(1,1) 3(1,0) 4)(0,1)

62. If (1,2) is a limiting point of a co-axal system for which $3x + y-10 = 0$, then the other limiting point is
1)(3,4) 2)(4,3) 3)(-3,-4) 4)(-1,-2)

63. If (-2,-1) is a limiting point of a co-axal system for which $x - y - 1 = 0$ is a member, then the other limiting point is
1)(-4,1) 2)(0,3) 3)(0.-3) 4)(4,-1)

64. I: The internal centre of similitude of the two circles $x^2+y^2+6x-2y+1=0, x^2+y^2-2x-6y+9=0$ is (0,5/2)
II: The external centre of similitude of the two circles $x^2+y^2-2x-6y+9=0, x^2+y^2=4$ is (2,6)
1)only I is true 2)only II is true 3)both I and II are true 4) neither I nor II true

65. If the equation of the circle of radius 5 and which touches the circle $x^2+y^2-2x-4y-20-=0$ at the point (5,5) is $x^2+y^2+2ax+2by+c=0$ then the ascending order of a,b,c is
1)a,b,c 2)b,c,a 3)c,a,b 4)a,c,b

66. Match the following

Circles	Property of the circles
I. $x^2+y^2-4x+6y+8=0, x^2+y^2-10x-6y+14=0$	a) touch internally
II. $x^2+y^2-8x+6y=56=0, x^2+y^2=16$	b) touch externally
III. $x^2+y^2-4x-6y-12=0, x^2+y^2+6x-8y+21=0$	c)intersect at two points
IV. $x^2+y^2-2x-6y+9=0, x^2+y^2+6x-2y+1=0$	d)one lies out side the other

1)a,b,c,d 2)b,a,c,d 3)c,a,b,d 4)d,c,b,a

67.. Match the following.

Circles	Number of common tangents
I. $x^2+y^2=4, x^2+y^2-8x+12=0$	a)0
II. $x^2+y^2=1, x^2+y^2-2x-6y+6=0$	b)1
III. $x^2+y^2=16, x^2+y^2-8x+6y-56=0$	c)2
IV. $x^2+y^2-2x-6y+9=0, x^2+y^2+6x-2y+1=0$	d)3
	e)4

1)a,b,c,d 2)d,e,b,a 3)c,b,e,d 4)a,c,b,d

68. Match the following.

Circles	Radical axis
I. $x^2+y^2+3x+4y-5=0,, x^2+y^2-5x+5y-6=0$	a)$x+10y-2=0$
II. $x^2+y^2-6x-4y-44=0, x^2+y^2-14x-5y-24=0$	b)$8x-y+1=0$
III. $3x^2+3y^2-7x+8y+11=0, x^2+y^2-3x-4y+5=0$	c)$8x+y-20=0$

1)a,b,c 2)b,c,a 3)c,a,b 4)a,c,b

69. The angle of intersection of the circles $x^2+y^2=16$ and $x^2+y^2-2x-4y-4=0$
1)$\cos^{-1} 5/6$ 20 $\cos^{-1} 2/3$ 3) $\pi/4$ 4) $\pi/2$

70. The internal centre of similitude of the circles $x^2+y^2+6x-2y+1=0$, $x^2+y^2-2x-6y+1=0$ is
1)(-1,2) 2)(0,5/2) 3)(2,0) 4)(2,5/2)

71. The external centre of similitude for the circles $x^2+y^2-2x-6y+9=0$; $x^2+y^2=4$ is
1)(2,4) 2)(2,5) 3)(5,6) 4)(2,6)

72. The circles $x^2+y^2-6x-9y+13=0$, $x^2+y^2-2x-16y=0$ touch each other. The common tangent at the point of contact is
1)$4x-7y-13=0$ 2)$4x-7y+13=0$ 3)$4x+7y-13=0$ 4)$4x+7y+13=0$

73. The condition the circles $x^2+y^2+2a_1x+2b_1y=0$ & $x^2+y^2+2a_2x+2b_2y=0$ touch each other is
1)$a_1a_2+b_1b_2=0$ 2)$a_1a_2=b_1b_2$ 3)$a_1b_2+a_2b_1=0$ 4)$a_1b_2=a_2b_1$

74. The condition that the circles $x^2+y^2+2ax+c=0$ and $x^2+y^2+2by+c=0$ may touch each other is
1)$c^2=a^2+b^2$ 2)$c=ab$ 3)$1/c=1/a+1/b$ 4)$1/c^2=1/a^2+1/b^2$

PREVIOUS EAMCET PAPER'S PROBLEMS

75. If the circles $x^2+y^2=a^2$, $x^2+y^2-6x-8y+9=0$ touch externally than a=
1)1 2)-1 3)21 4)16 [EAMCET 85]

76. The equation of the circle passing through (0,0) and cutting orthogonally the circles $x^2+y^2+6x-15=0$,$x^2+y^2-8y+10=0$is [EAMCET 86]
1)$2x^2+2y^2-10x-5y=0$ 2)$2x^2+2y^2+10x+5y=0$
3)$x^2+y^2-5x+5y=0$ 4)$2x^2+2y^2+10x-5y=0$

77. The equation of the circle passing through (0,0) and cutting orthogonally the circles $x^2+y^2+6x-15=0$,$x^2+y^2-8y+10=0$ is [EAMCET 86]
1)$2x^2+2y^2-10x-5y=0$ 2)$2x^2+2y^2+10x+5y=0$
3)$x^2+y^2-5x+5y=0$ 4)$2x^2+2y^2+10x-5y=0$

78. The distance from (1,2) to the radical axis of the circles$x^2+y^2+6x-16=0$,$x^2+y^2-2x-6y-6=0$ is [EAMCET 86]
1)1 2)2 3)$\sqrt{5}$ 4) $\sqrt{2}$

79. The number of common tangents to the circles $x^2+y^2+2x+8y-23=0$, $x^2+y^2-4x-10y+19=0$ is
1)4 2)2 3)3 4)1 [EAMCET 87]

80. The angle at which the circles $x^2+y^2+8x-2y-9=0$,$x^2+y^2-2x+8y-7=0$ intersect is
1)$\pi/6$ 2)$\pi/4$ 3)$\pi/3$ 4)$\pi/2$ [EAMCET 87]

81. One limiting point of the co-axal system of circles containing $x^2+y^2-6x-6y+4=0$ and $x^2+y^2-2x-4y+3=0$ is [EAMCET 87]
1)(-1,1) 2)(-1,2) 3)-2,1) 4)(-2,2)

82. The equation of the circle passing through the origin and the points of intersection of the two circles $x^2+y^2-4x-6y-3=0, x^2+y^2+4x-2y-4=0$ is [EAMCET 90]
1)$x^2+y^2-28x-18y=0$ 2)$x^2+y^2+28x-18y=0$
3)$x^2+y^2+28x+18y=0$ 4)$x^2+y^2-28x+18y=0$

83. The number of common tangents to the two circles $x^2+y^2=4, x^2+y^2-8x+12=0$ is
1)1 2)2 3)3 4)4 [EAMCET 90]

84. The distance of the point (1,2) from the common chord of the circles $x^2+y^2-2x+3y-5=0$ and $x^2+y^2+10x+8y-1=0$ is
1)2 2)1 3)$\sqrt{2}$ 4)$\sqrt{3}$ [EAMCET 90]

85. The circles $x^2+y^2-4x+6y+8=0$, $x^2+y^2-10x-6y+14=0$ [EAMCET 91]
1)touch internally 2)touch externally
3)intersecting at two points 4)are such that one completely lies outside the other

86. The equation of the circle described on the common chord of the circles $x^2+y^2+2x=0$, $x^2+y^2+2y=0$ as diameter is [EAMCET 94]
1)$x^2+y^2+x-y=0$ 2)$x^2+y^2-x-y=0$ 3)$x^2+y^2-x-y=0$ 4)$x^2+y^2+x+y=0$

87. Consider the circles $x^2+(y-1)^2=9, (x-1)^2+y^2=25$. They are such that [EAMCET94]
1)these circles touch each other 2)one of these circles lies entirely inside the other
3)each of these circles lies outside the other 4)they intersect in two points

88. A circle passes through origin and has its centre on y=x. If it cuts $x^2+y^2-4x-6y+10=0$ orthogonally then the equation of the circle is [EAMCET 94]
1)$x^2+y^2-x-y=0$ 2)$x^2+y^2-4x-4y=0$ 3)$x^2+y^2-6x-3y=0$ 4)$x^2+y^2+2x+2y=0$

89. The number of common tangents to the two circles $x^2+y^2-x=0, x^2+y^2+x=0$ is
1)2 2)1 3)3 4)3 [EAMCET94]

90. Origin is a limiting point of a coaxal system of which $x^2+y^2-6x-8y+1=0$ is a member. The other limiting point is [EAMCET 94]
1)(-2,-4) 2)(3/25,4/25) 3)(-3/25,-4/25) 4)(4/25,3/25)

91. A circle of the co-axal system with limiting points (0,0) and (1,0) is
1)$x^2+y^2-3x=0$ 2)$x^2+Y^2-6x+3=0$ 3)$x^2+y^2=1$ 4)$x^2+y^2-x+1=0$ [EAMCET 95]

92. The distance of the point (1,-2) from the common chord of the circles $x^2+y^2-5x+4y-2=0$ and $x^2+y^2-2x+8y+3=0$ is
1)0 2)1 3) 2 4)3 [EAMCET 96]

93. The distance of the point (1,-2) from the common chord of the circles $x^2+y^2-5x+4y-2=0$ and $x^2+y^2-2x+8y+3=0$ is
1)0 2)1 3) 2 4)3 [EAMCET 96]

94. The radical centre of the circles $x^2+y^2-x+3y-3=0, x^2+y^2-2x+2y+2=0, x^2+y^2+2x+3y-9=0$ is
1)(2,3) 2)(2,-3) 3(-2,3) 4)(-2,-3) [EAMCET 96]

95. If (0,0) is one limiting point of a co-axal system of circles whose common radical axis is the line x+ y=1 then the other limiting point is [EAMCET 96]
1)(1,1) 2)-1,-1) 3)(1,-1) 4)-1,1)

96. The radical axis of the co-axal system of circles with limiting points (1,2) and(4,3) is given by the equation [EAMCET 97]
1)3x-y+10=0 2)3x+y-10=0 3)x-y-1=0 4)4x-2y-5=0

97. The radical axis of the circles$x^2+y^2-6x-4y-44=0$ and $x^2+y^2-14x-5y-24=0$ is
1)8x+y-30=0 2)8x+y+20=0 3)8x+3y-20=0 4)8x+y-20=0 [EAMCET 98]

98. The slope of the radical axis of the circles$x^2+y^2+3x+4y-5=0$ and $x^2+y^2-5x+5y-6=0$ is
1)1 2)3 3)5 4)8 [EAMCET 99]

99. If the circle $x^2+y^2+2x-2y+4=0$ cuts the circle $x^2+y^2+4x-2fy+2=0$ Orthogonally, then f=
1)1 2)2 3)-1 4)-2 [99]

100. If the circles of same radius a and centres (2,3),(5,6) cut orthogonally, then a=
1)1 2)2 3)3 4)4 [88,96,2000]

101. If (1,2) is a limiting point of the co-axal system of circles containing the circle $x^2+y^2+x-5y+9=0$ then the equation of the radical axes is [2000]
1)x+3y+9=0 2)3x-y+4=0 3)x+9y-4=0 4)3x-y-1=0

102. If the circles of same radius a and centres (2,3),(5,6) cut orthogonally, then a=
1)1 2)2 3)3 4)4 [,96,2000]

103. The number of common tangents that can be drawn to the circles $x^2+y^2=1$ and $x^2+y^2-2x-6y+6=0$ is
1)1 2)2 3)3 4)4 [2000]

104. The radical axis of the circles$x^2+y^2+3x+4y-5=0$ and $x^2+y^2-5x+5y-6=0$ is
1)8y-x+1=0 2)8x-y+1=0 3)8x-8y+1=0 4)y-8x+1=0 [2001]

105. The limiting points of the co-axal system containing the two circles $x^2+y^2+2x-2y+2=0$ and $25(x^2+y^2)-10x-80y+65=0$ are [2001]

1)(1,-1),(-5,-40) 2)(1,-1),(-1/5,-8/5) 3)(-1,1),(1/5,8/5) 4)-1,1),(-1'5,-8'5)

106. A line l meets the circle $x^2+y^2=61$ in A,B and p(-5,6) is such that PA=PB=10. Then the equation of l is [2004]
1)5x+6y+11=0 2)5x-6y-11=0 3)5x-6y+11=0 4)5x-6y+122=0

107. If x-y+1=0 meets the circle $x^2+y^2+y-1=0$ at A and B, then the equation of the circle with ABas diameter is: (2005)
1)$2(x^2+y^2)+3x-y+1=0$ 2) $)2(x^2+y^2)+3x-y+2=0$
3)$2(x^2+y^2)+3x-y+3=0$ 4)$x^2+y^2+3x-y+1=0$

108. The number of common tangents to the two circles $x^2+y^2-8x+2y=0$ and $x^2+y^2-2x-16y+25=0$ is :
1)1 2)2 3)3 4)4 (2006)

109. Observe the following statements: (2006)
I. The circle $x^2+y^2-6x-4y-7=0$ touches y-axis
II. The circle $x^2+y^2+6x+4y-7=0$ touches x-axis
Which of the following is a correct statement?
1)Both I and II are true 2)Neither I nor II is true
3)I is true, II is false 4)I is false, II is true

110. The length of tangent drawn to the circle $x^2+y^2-2x+4y-11=0$ from the point (1,3) is:
1)1 2)2 3)3 4)4 (2006)

111. The condition for the coaxial system $x^2+y^2+2\lambda x+c=0$, where λ is a parameter and c is a constant, to have distinct limiting points is (2007)
1) c = 0 2) c < 0 3) c =-1 4) c > 0

112. If θ is the angle between the tangents from (-1,0) to the circle $x^2+y^2-4x-6y+9=0$ is (2008)
1)(1,1/2) 2)(2,1) 3)(0,1) 4)(1,0)

113. The point (3, –4) lies on both the circles $x^2+y^2-2x+8y+13=0$ and $x^2+y^2-4x+6y+11=0$. Then the angle between the circles is: (2009)

1) 60^0 2) $\tan^{-1}\left(\frac{1}{2}\right)$ 3) $\tan^{-1}\left(\frac{3}{5}\right)$ 4) 135^0

114. The equation of the circle which passes through the origin and cuts orthogonally each of the circles $x^2+y^2-6x+8=0$ and $x^2+y^2-2x-2y=7$ is: (2009)

1) $3x^2+3y^2-8x-13y=0$ 2) $3x^2+3y^2-8x-29y=0$
3) $3x^2+3y^2+8x+29y=0$ 4) $3x^2+3y^2-8x+29y=0$

115. If the circle $x^2+y^2+2x+3y+1=0$ cuts another circle $x^2+y^2+4x+3y+2=0$ in A and B, then the equations of the circle with AB as a diameter is : (2010)

1) $x^2+y^2+x+3y+3=0$ 2) $2x^2+2y^2+2x+6y+1=0$

3) $x^2+y^2+x+6y+1=0$ 4) $2x^2+2y^2+x+3y+1=0$

116. The length of the common chord of the circles of radii 15 and 20 whose centers are 25 units of distance apart, is : (2010)

1) 12 2) 16 3) 24 4) 25

117. If the circle $x^2 + y^2 + 8x - 4y + c = 0$ touches the circle $x^2 + y^2 + 2x + 4y - 11 = 0$ externally and cuts the circle $x^2 + y^2 - 6x + 8y + k = 0$ orthogonally then k = [2011]

1) 59 2) -59 3) 19 4) -19

118. The point of contactof the circle $x^2+y^2+2x+2y+1=0$ and $x^2+y^2-2x+2y+1=0$ is [2011]

1) (0, 1) 2) (0, -1) 3) (1, 0) 4) (-1, 0)

119. The equation to the line joining the centres of the circles belonging to the coaxial system of circles $4x^2 + 4y^2 - 12x + 6y - 3 + \lambda(x + 2y - 6) = 0$ is [2012]

1) $8x - 4y - 15 = 0$ 2) $8x - 4y + 15 = 0$

3) $3x - 4y - 5 = 0$ 4) $3x - 4y + 5 = 0$

120. (a, 0) & (b, 0) are centres of two circles belonging to a co- axial system of which y – axis is the radical axis. If radius of one of the circles is 'r', then the radius of the other circle is [2013]

1) $(r^2 + b^2 + a^2)^{1/2}$ 2) $(r^2 + b^2 - a^2)^{1/2}$

3) $(r^2 + b^2 - a^2)^{1/3}$ 4) $(r^2 + b^2 + a^2)^{1/3}$

121. If the circle $x^2+y^2+4x-6y+c=0$ bisects the circumference of the circle $x^2+y^2-6x+4y-12=0$, then c = [2013]

1) 16 2) 24 3) – 42 4) – 62

122. The length of the common chord of the two circles $x^2+y^2-4y=0$ & $x^2+y^2-8x-y+11=0$ is **(2014)**

1) $\frac{\sqrt{11}}{2}$ 2) $\sqrt{135}$ **3)** $\frac{\sqrt{135}}{4}$ 4) $\frac{\sqrt{145}}{4}$

123. The locus of the centre of the circle which cuts the circle $x^2 + y^2 - 20x + 4 = 0$ orthogonally & touches the lune x = 2 is **(2014)**

1) $y^2 = 4x$ **2) $y^2 = 16x$** 3) $x^2 = 4y$ 4) $x^2 = 16y$

124. The length of the common chord of the two circles $(x-a)^2+y^2=a^2$ & $x^2+(y-b)^2=b^2$ is **(2015)**

1) $\frac{ab}{\sqrt{a^2+b^2}}$ **2)** $\frac{2ab}{\sqrt{a^2+b^2}}$ 3) $\frac{a+b}{\sqrt{a^2+b^2}}$ 4) $\sqrt{a^2+b^2}$

125. The equation of the circles passing through (1, 2) & the points of intersection of the circles $x^2 + y^2 - 8x - 6y + 21 = 0$ & $x^2 + y^2 - 2x - 15 = 0$ **(2015)**
1) $x^2 + y^2 + 6x - 2y + 9 = 0$ 2) $x^2 + y^2 - 6x - 2y + 9 = 0$
3) $x^2 + y^2 - 6x - 4y + 9 = 0$ 4) $x^2 + y^2 - 6x + 4y + 9 = 0$

126. If $x^2 + y^2 - 4x - 2y + 5 = 0$ & $x^2 + y^2 - 6x - 4y - 3 = 0$ are members of a coaxal system of circles then centre of a point circle in the system is **(2015 A.P)**
1) (-5, -6) 2) (5, 6) 3) (3, 5) 4) (-8, -13)

127. If $x - y + 1 = 0$ meets the circle $x^2 + y^2 + y - 1 = 0$ at A & B then the equation of the circle with AB as diameter is **(2015 A.P)**
1) $2(x^2 + y^2) + 3x - y + 1 = 0$ 2) $2(x^2 + y^2) + 3x - y + 2 = 0$
3) $2(x^2 + y^2) + 3x - y + 3 = 0$ 4) $x^2 + y^2 + 3x - y + 1 = 0$

128. If the circles $x^2 + y^2 - 2\lambda x - 2y - 7 = 0$ & $3(x^2 + y+2^{)} - 8x + 29y = 0$ are orthogonal then $\lambda =$ (2016)
1) 4 2) 3 3) 2 4) 1

129. The radical centre of the circles $x^2 + y^2 = 1$, $x^2 + y^2 - 2x - 3 = 0$ & $x^2 + y^2 - 2y - 3 = 0$ is (2016)
1) (1, 1) 2) (1, -1) 3) (-1, 1) 4) (-1, -1)

130. A circle S cuts three circles $x^2 + y^2 - 4x - 2y + 4 = 0$, $x^2 + y^2 - 2x - 4y + 1 = 0$ & $x^2 + y^2 + 4x + 2y + 1 = 0$ orthogonally. Then the radius of S is (2016AP)
1) $\sqrt{\frac{29}{8}}$ 2) $\sqrt{\frac{28}{11}}$ 3) $\sqrt{\frac{29}{7}}$ 4) $\sqrt{\frac{29}{5}}$

131. The distance between the vertex & the focus of the parabola $x^2 - 2x + 3y - 2 = 0$ is (2016AP)
1) $\frac{4}{5}$ 2) $\frac{3}{4}$ 3) $\frac{1}{2}$ 4) $\frac{5}{6}$

132. Two circles of equal radius 'a' cut orthogonally. If their centres are (2, 3) & (5, 6), then radical axis of these circles passes through the point (2017)
1) (3a, 5a) 2) (2a, a) 3) $\left(a, \frac{5a}{3}\right)$ 4) (a, a)

133. If $A\left(\frac{\pi}{3}\right), B\left(\frac{\pi}{6}\right)$ are the points on the circle represented in parametric form with centre (0, 0) & radius 12 then the length of the chord AB is (2017)
1) $6\left(\sqrt{6}-\sqrt{2}\right)$ 2) $6\left(\sqrt{6}-\sqrt{3}\right)$ 3) $\sqrt{2}\left(\sqrt{3}-1\right)$ 4) $6\left(\sqrt{3}-1\right)$

134. ABC is a triangle & the radical centre of the circles with AB, BC, CA as the diameters is (-6, 5). Now if A = (3, 2), B = (2, 1) then C = (2017AP)

1) (1, 1) 2) (1, 2) 3) (2, 3) 4) (1, -2)

135. If the cosine of the angle between the two circles $x^2 + y^2 + 2x + 4y - 3 = 0$ & $x^2 + y^2 + 2kx - 2y - 1 = 0$ is $\frac{1}{2\sqrt{3}}$ then $k^2 =$ (2017AP)

1) 2 2) 4 3) 16 4) 8

KEY

1) 1	2) 2	3) 2	4) 2	5) 2	6) 1	7) 1	8) 3	9) 2	10) 4
11) 3	12) 1	13) 2	14) 1	15) 2	16) 3	17) 1	18) 2	19) 2	20) 2
21) 4	22) 3	23) 4	24) 4	25) 1	26) 1	27) 1	28) 4	29) 3	30) 2
31) 1	32) 3	33) 1	34) 4	35) 3	36) 4	37) 4	38) 1	39) 3	40) 1
41) 2	42) 3	43) 2	44) 1	45) 1	46) 2	47) 3	48) 4	49) 3	50) 2
51) 1	52) 1	53) 1	54) 3	55) 1	56) 2	57) 1	58) 1	59) 4	60) 4
61) 1	62) 2	63) 3	64) 3	65) 1	66) 2	67) 2	68) 2	69) 1	70) 1
71) 4	72) 1	73) 4	74) 4	75) 1	76) 1	77) 1	78) 1	79) 3	80) 4
81) 1	82) 1	83) 3	84) 1	85) 2	86) 4	87) 2	88) 3	89) 4	90) 2
91) 2	92) 1	93) 1	94) 1	95) 1	96) 2	97) 4	98) 4	99) 1	100) 3
101) 2	102) 3	103) 4	104) 2	105) 3	106) 3	107) 1	108) 2	109)	110) 3
111) 4	112) 1	113) 2	114) 2	115) 3	116) 3	117) 2	118) 3	119) 1	120) 2
121) 4	122) 3	123) 2	124) 2	125) 3	126) 1	127) 1	128) 4	129) 4	130) 1
131) 2	132) 3	133) 1	134) 4	135) 2	136)	137)	138)	139)	140)

EXERCISE-B

1. The equation of the circle passing through (0,0) and cutting orthogonally the circles $x^2+y^2+6x-15=0, x^2+y^2-8y+10=0$ is

1) $2x^2+2y^2-10x-5y=0$ 2) $2x^2+2y^2+10x+5y=0$
3) $x^2+y^2-5x+5y=0$ 4) $2x^2+2y^2+10x-5y=0$ 100.

2. The equation of the circle passing through (0,0) and cutting orthogonally the circles $x^2+y^2+6x-15=0, x^2+y^2-8y+10=0$ is

1) $2x^2+2y^2-10x-5y=0$ 2) $2x^2+2y^2+10x+5y=0$
3) $x^2+y^2-5x+5y=0$ 4) $2x^2+2y^2+10x-5y=0$

3. The equation of the circle passing through the origin and the points of intersection of The two circles $x^2+y^2-4x-6y-3=0, x^2+y^2+4x-2y-4=0$ is

1) $x^2+y^2-28x-18y=0$ 2) $x^2+y^2+28x-18y=0$
3) $x^2+y^2+28x+18y=0$ 4) $x^2+y^2-28x+18y=0$

4. The equation of the circle described on the common chord of the circles $x^2+y^2+2x=0$, $x^2+y^2+2y=0$ as diameter is

1)$x^2+y^2+x-y=0$ 2)$x^2+y^2-x-y=0$ 3)$x^2+y^2-x-y=0$ 4)$x^2+y^2+x+y=0$

5. a circle passes through origin and has its centre on y=x. If it cuts $x^2+y^2-4x-6y+10=0$ orthogonally then the equation of the circle is
1)$x^2+y^2-x-y=0$ 2)$x^2+y^2-4x-4y=0$ 3)$x^2+y^2-6x-3y=0$ 4)$x^2+y^2+2x+2y=0$

6. The radical centre of the circles $x^2+y^2-x+3y-3=0, x^2+y^2-2x+2y+2=0$, $x^2+y^2+2x+3y-9=0$ is
1)(2,3) 2)(2,-3) 3(-2,3) 4)(-2,-3)

7. If the circle $x^2+y^2+2x-2y+4=0$ cuts the circle $x^2+y^2+4x-2fy+2=0$ Orthogonally, then f=
1)1 2)2 3)-1 4)-2

8. If the circles of same radius a and centres (2,3),(5,6) cut orthogonally, then a=
1)1 2)2 3)3 4)4

9. If (1,2) is a limiting point of the co-axal system of circles containing the circle $x^2+y^2+x-5y+9=0$ then the equation of the radical axes is
1)x+3y+9=0 2)3x-y+4=0 3)x+9y-4=0 4)3x-y-1=0

10. If the circles of same radius a and centres (2,3),(5,6) cut orthogonally, then a=
1)1 2)2 3)3 4)4

11. The radical axis of the circles$x^2+y^2+3x+4y-5=0$ and $x^2+y^2-5x+5y-6=0$ is
1)8y-x+1=0 2)8x-y+1=0 3)8x-8y+1=0 4)y-8x+1=0

12. A line l meets the circle $x^2+y^2=61$ in A,B and p(-5,6) is such that PA=PB=10. Then the equation of l is
1)5x+6y+11=0 2)5x-6y-11=0 3)5x-6y+11=0 4)5x-6y+122=0

13. If x-y+1=0 meets the circle $x^2+y^2+y-1=0$ at A and B, then the equation of the circle with ABas diameter is:
1)$2(x^2+y^2)+3x-y+1=0$ 2))$2(x^2+y^2)+3x-y+2=0$
3)$2(x^2+y^2)+3x-y+3=0$ 4)$x^2+y^2+3x-y+1=0$

14. The radical centre of the circles $x^2+y^2=1, x^2+y^2-2x=1, x^2+y^2-2y=1$ is
1)(0,0) 2)(1,1) 3(1,0) 4)(0,1)

15. The length of the common chord of the circles $x^2+y^2-2x-2=0$ and $x^2+y^2-5x6y+4=0$ is
1) $\sqrt{14/5}$ 2) $2\sqrt{14/5}$ 3) $2\sqrt{14}/5$ 4) $\sqrt{14}/5$

16. The radical centre of the circles $x^2+y^2-2x+6y=0$, $x^2+y^2-4x-2y+6=0$ and $x^2+y^2-x+2y+3=0$ is
1)(0,3/4) 2)(-3,0) 3) (3,0) 4) (0,-3)

17. The radical centre of the circles $x^2+y^2+2x+4y+1=0, 2x^2+2y^2+6x+8y-3=0$ and $x^2+y^2-2x-6y-3=0$ is

1)(5/2,7/2) 2)(5/2,-7/2) 3)(-5/2, 7/5) 4) (5/2,-7/5)

18. If the circle $x^2+y^2+2gx+2fy+c=0$ bisects the circumference of $x^2+y^2+2g_1x+2f_1y+c_1=0$, then $2g_1(g-g_1)+2f_1(f-f_1) =$

1)$c+c_1$ 2) $c-c_1$ 3) $(c-c_1)/2$ 4) $(c+c_1)/2$

19. The circle with AB as diameter where A and B are the intersection points of $x^2+y^2=a^2$ and $x\cos\alpha+y\sin\alpha=p$ is

1)$x^2+y^2-a^2+2p(x\cos\alpha+y\sin\alpha)=0$ 2) $x^2+y^2-a^2-p(x\cos\alpha+y\sin\alpha-p)=0$

3)$x^2+y^2-a^2-2p(x\cos\alpha+y\sin\alpha-p)=0$ 4) $x^2+y^2-p(x\cos\alpha+y\sin\alpha-p)=0$

20. IF(0,0) is a limiting point of a co-axal system for which S=0 is a member, then the other limiting point is

1) $[gc / (g^2+f^2 , fc / g^2+f^2]$ 2) $[-gc / (g^2+f^2 , fc / g^2+f^2]$

3) $[-gc / (g^2+f^2 , -fc / g^2+f^2]$ 4) $[gc / (g^2+f^2 , -fc / g^2+f^2]$

21. If a circle passes through the point(a, b) and cuts the circle $x^2+y^2=4$ orthogonally, then the locus of its centre is

1)$2ax+2by+(a^2+b^2+4)=0$ 2)$2ax-2by-(a^2+b^2+4)=0$

3)$2ax-2by+(a^2+b^2+4)=0$ 4)$2ax+2by-(a^2+b^2+4)=0$

22. If the two circles $(x-1)^2+(y-3)^2=r^2$ and $x^2+y^2-8x+2y+8=0$ intersect in two distinct Points, then

1)$r<2$ 2)$r=2$ 3)$r>2$ 4)$2<r<8$

23. The condition the circles $x^2+y^2+2a_1x+2b_1y=0$ & $x^2+y^2+2a_2x+2b_2y=0$ touch each other is

1)$a_1a_2+b_1b_2=0$ 2)$a_1a_2=b_1b_2$ 3)$a_1b_2+a_2b_1=0$ 4)$a_1b_2=a_2b_1$

24. The condition that the circles $x^2+y^2+2ax+c=0$ and $x^2+y^2+2by+c=0$ may touch each other is

1)$c^2=a^2+b^2$ 2)$c=ab$ 3)$1/c=1/a+1/b$ 4)$1/c^2=1/a^2+1/b^2$

KEY

1) 1	2) 1	3) 1	4) 4	5) 3	6) 1	7) 1	8) 3	9) 2	10) 3
11) 2	12) 3	13) 1	14) 1	15) 2	16) 1	17) 4	18) 2	19) 3	20) 3
21) 4	22) 4	23) 4	24) 4						

AIEEE Problems

1. If the circles $(x-1)^2 + (y-3)^2 = r^2$ and $x^2 + y^2 - 8x + 2y + 8 = 0$ intersect in two distinct points, then [AIEEE 2003]

   1) $r < 2$ 2) $r = 2$ 3) $r > 2$ 4) $2 < r < 8$

2. If a circle passes through the point (a, b) and cuts the circle $x^2 + y^2 = 4$ orthogonally , then the locus of its centre is [AIEEE 2004]

   1) $2ax + 2by + (a^2 + b^2 + 4) = 0$ 2) $2ax - 2by - (a^2 + b^2 + 4) = 0$
   3) $2ax - 2by + (a^2 + b^2 + 4) = 0$ 4) $2ax + 2by - (a^2 + b^2 + 4) = 0$

3. The intercepts on the line y = x by the circle $x^2 + y^2 + 2x = 0$ is AB. Equation of the circle on AB as a diameter is [AIEEE 2004]

   1) $x^2 + y^2 + 2x = 0$ 2) $x^2 + y^2 + x - y = 0$
   3) $x^2 + y^2 + x + y = 0$ 4) $x^2 + y^2 - x + y = 0$

4. A circle touches the x - axis and also touches the circle with centre at (0, 3) and radius 2. The locus of the centre of the circle is [AIEEE 2005]

   1) an ellipse 2) a circle 3) a hyperbola 4) a parabola

5. If the circles $x^2 + y^2 + 2ax + cy + a = 0$ and $x^2 + y^2 - 3ax + dy + 1 = 0$ intersects in two distinct points P and Q then the line $5x + by - a = 0$ passes through P and Q for [AIEEE 2005]

   1) exactly one value of a 2) no value of a
   3) infinitely many values of a 4) exactly two values of a

6. If a circle passes through the point (a, b) and cuts the circle $x^2 + y^2 = p^2$ orthogonally, then the equation of the locus of its centre is [AIEEE 2005]

   1) $x^2 + y^2 - 3ax - 4by + (a^2 + b^2 - p^2) = 0$ 2) $2ax + 2by - (a^2 - b^2 + p^2) = 0$
   3) $x^2 + y^2 - 2ax - 3by + (a^2 - b^2 - p^2) = 0$ 4) $2ax + 2by - (a^2 + b^2 + p^2) = 0$

KEYS

1) 4	2) 4	3) 4	4) 2	5) 2	6) 4

CONIC SECTION
FORMULAE

	PARABOLA	ELLIPSE	HYPERBOLA
Eccentricity	$e=1$	$e=\sqrt{(a^2-b^2)}/a^2$	$e=\sqrt{(a^2+b^2)}/a^2$
Length of latusrectum	$4a$	$2b^2/a$	$2b^2/a$
Vertices	$(0,0)$	$(\pm a,0)$	$(\pm a,0)$
Foci	$(a,0)$	$(\pm ae,0)$	$(\pm ae,0)$
Equation of directrices	$x+a=0$	$x=\pm a/e$	$x=\pm a/e$
Equation of tangent at (x_1,y_1) to the	$S_1=0$	$S_1=0$	$S_1=0$
Equation of the normal at (x_1,y_1) to the	$y-y_1=\frac{-y_1}{2a}(x-x_1)$	$a^2x/x_1-b^2y/y_1=a^2-b^2$	$a^2x/x_1+b^2y/y_1=a^2+b^2$
Equation of chord of contact of (x_1,y_1)	$S_1=0$	$S_1=0$	$S_1=0$
Equation of polar of (x_1,y_1) w.r.t	$S_1=0$	$S_1=0$	$S_1=0$
The condition for the line $y=mx+c$ to be tangent	$C=a/m$	$C^2=a^2m^2+b^2$	$C^2=a^2m^2-b^2$
The condition for the line $lx+my+n=0$ to be tangent	$ln=am^2$	$a^2l^2+b^2m^2=n^2$	$a^2l^2-b^2m^2=n^2$
The point of contact of $lx+my+n=0$ and the pole of $lx+my+n=0$ w.r.t	$(n/l,-2am/l)$	$(-a^2l/n,-b^2m/n)$	$(-a^2l/n,b^2m/n)$

Equation of chord bisected at (x_1,y_1)	$S_1=S_{11}$	$S_1=S_{11}$	$S_1=S_{11}$
The condition for the line $lx+my+n=0$ to be normal	$al(l^2+2m^2)+m^2n=0$	$a^2/l^2+b^2/m^2=(a^2-b^2)^2/n^2$	$a^2/l^2-b^2/m^2=(a^2+b^2)^2/n^2$
Condition for the points $(x_1,y_1),(x_2,y_2)$ to be conjugate	$S_{12}=0$	$S_{12}=0$	$S_{12}=0$
Condition for the lines $l_1x+m_1y+n_1=0$ and $l_2x+m_2y+n_2=0$ to be conjugate	$l_1n_2+l_2n_1=2am_1m_2$	$a^2l_1l_2+b^2m_1m_2=n_1n_2$	$a^2l_1l_2-b^2m_1m_2=n_1n_2$
The point (x1,y1) lies inside, on or outside according as	$S_{11} < 0$ $S_{11} = 0$ $S_{11} > 0$	$S_{11}< 0$ $S_{11}= 0$ $S_{11}> 0$	$S_{11}<0$ $S_{11}= 0$ $S_{11}>0$
The parametric equations	$X=at^2$, $y=2at$	$x=a\cos\theta$, $y=b\sin\theta$	$x=a\sec\theta$, $y=b\tan\theta$
Equation of tangent in parametric form	$yt=x+at^2$	$x\cos\theta/a+y\sin\theta/b=1$	$x\sec\theta/a+y\tan\theta/b=1$
Equation of normal in parametric form	$y+xt=2at+at^3$	$ax/\cos\theta-by/\sin\theta=a^2-b^2$	$ax/\sec\theta+by/\tan\theta=a^2+b^2$
Equation of chord joining	t_1 and t_2 is $y(t_1+t_2)=2x+2at_1t_2$	α,β is $[x\cos(\alpha+\beta)/2]/a+y\sin((\alpha+\beta)/2= \cos(\alpha-\beta)/2$	α,β is$[x\cos(\alpha-\beta)/2]/a+y\sin((\alpha-\beta)/2= \cos(\alpha+\beta)/2$

Equation of tangent in slope form and the point of contact	Y=mx+a/m $(a/m^2,2a/m)$	$y=mx\pm\sqrt{a^2m^2+b^2}$ $(-a^2m/c\ ,\ b^2/c)$	$y=mx\pm\sqrt{a^2m^2-b^2}$ $(-a^2m/c,-b^2/c)$
Director circle (locus of point of intersection of $\perp$ tangents)	x=-a (directrix)	$x^2+y^2=a^2+b^2$	$x^2+y^2=a^2-b^2$
Focal distance property: If $P(x_1,y_1)$ is a point on	$SP=x_1+a$	$SP+S'P=2a$	$\lvert SP-S'P\rvert=2a$
No of tangents. From external pt.	2	2	2
No.of normals from any point	3	4	4
Auxiliary circle	_	$x^2+y^2=a^2$	$x^2+y^2=a^2$

13. PARABOLA

1. The set of points in a plane whose distances from a fixed point and a fixed straight line are in constant ratio e is called a 'conic'. The fixed point is called the 'focus' and the fixed straight line is 'Directrix' and the ratio e is called the 'eccentricity' of the conic.

2. If $e = 1$ the conic is parabola.

3. If $e < 1$ the conic is ellipse.

4. If $e > 1$ the conic is hyperbola.

5. For the parabola $y^2 = 4ax$

   $e = 1$,focus = $(a, 0)$, vertex = $(0, 0)$ and length of the latusrectum= $4a$.

6. The parameter equation are $x = at^2$, $y = 2at$.

7. The line $y = mx + c$ is tangent to the parabola $y^2 = 4ax$ if $c = \frac{a}{m}$. The point of contact is $(a/m^2, 2a/m)$.

8. Equation of tangent in slope form is $y = mx + \frac{a}{m}$.

9. The line $lx + my + n = 0$ is a tangent to the parabola $y^2 = 4ax$ if $ln = am^2$.

10. If the line $lx + my + n = 0$ is a tangent then the point of contact is $\left(\frac{n}{l}, \frac{-2am}{l}\right)$.

11. The number of tangents that can be drawn through an
    (ii) internal point 0
    (iii) a point on the centre 1
    (iv) an external point 2.

12. The equation of pair of tangents from an external point (x_1, y_1) is $S_1^2 = S\,S_{11}$.

13. Pole of the straight line $lx + my + n = 0$ w.r.to the parabola $y^2 = 4ax$ is $\left(\frac{n}{l}, \frac{-2am}{l}\right)$.

14. Equation of the chord joining two point t_1 and t_2 is $y\,(t_1 + t_2) - 2x - 2at_1t_2 = 0$.

15. Chord joining two points is a focal chord if $t_1t_2 = -1$.

16. Equation of tangent at t is $yt - x - at^2 = 0$.

17. Equation of normal at t is $y + xt = 2at + at^3$.

18. If the normal at t_1 to the parabola meets the curve again at t_2 then $t_2 = -t_1 - \frac{2}{t_1}$

19. The normals at t_1 and t_2 on the parabola intersects on the curve if $t_1t_2 = 2$.

20. The point of intersection of tangents at t_1 and t_2 on the parabola is $(at_1t_2, a(t_1 + t_2))$.

21. If the axis of parabola is parallel to x-axis, equation of the parabolas will be of the form $(y-k)^2 = 4a(x-h)$ (or) $(y-k)^2 = -4a(x-h)$.

22. If the axis of the parabola is parallel to y –axis, equation of the parabola will be of the form $(x-h)^2 = 4a(y-k)$ (or) $(x-h)^2 = -4a(y-k)$.

23. If m_1 and m_2 are the slopes of tangents from an external point (x_1, y_1) to the Parabola $y^2 = 4ax$ then they are the roots fo $m^2x_1 - my_1 + a = 0$ and hence $m_1 + m_2 = y_1/x_1$ and $m_1m_{\backslash 2} = a/x_1$.

24. For the parabola $y^2 = 4a(x + a)$ equation of tangent in slope form is $y = m(x + a) + a/m$

25. If θ is the angle between tangents drawn from (x_1, y_1) to parabola $y^2 = 4ax$ then $\tan\theta = \sqrt{S_{11}} \big/ x_1 + a$.

26. The condition that thel line $lx + my + n = 0$ to be a normal to parabola $y^2 = 4ax$ is $al^3 + 2alm^2 + m^2n = 0$.

27. Pole of line $lx + my + n = 0$ w.r.t to parabola is $x^2 = 4ay$ is $\left(\frac{-2al}{m}, \frac{n}{m}\right)$

28. Area of triangle formed by Tangent, normal at (x_1, y_1) on $y^2 = 4ax$ and x-axis is $(a + x_1)y_1$.

29. Length of chord Intercepted by line $y = mx + c$ on parabola $y^2 = 4ax$ is $\frac{4}{m^2}\sqrt{a(a - mc)(1 + m^2)}$.

30. Length of normal chord at t on $y^2 = 4ax$ is $\frac{4a(1 + t^2)^{\frac{3}{2}}}{t^2}$

31. Least length of focal chord is 4a.

32. If (x_1, y_1) is one end of a focal chord of $y^2 = 4ax$ the other end $\left[\frac{a^2}{x_1}, -\frac{4a^2}{y_1}\right]$

33. The parabola $x = ly^2+my+n$, Vertex = $\left[n-\frac{m^2}{4l}, \frac{-m}{2l}\right]$, Focus = $\left[n+\frac{1-m^2}{4l}, \frac{-m}{2l}\right]$

Latusrectum $= 1/l$, axis is $y + (m/2l) = 0$, directrix is $x = \left[n+\frac{1-m^2}{4l}\right]$.

34. Tthe parabola $y = lx^2+mx+n$, Vertex $=\left[-\frac{m}{2l}, n-\frac{-m^2}{4l}\right]$, Focus = $\left[\frac{-m}{2l}, n+\frac{1-m^2}{4l}\right]$.

Latusrectum $= 1/l$, axis is $y + m/2l = 0$, directrix is $y = n+\frac{1-m^2}{4l}$.

35. Angle between the pair of tangents drawn from (x_1, y_1) to be parabola $S \equiv y^2 - 4ax = 0$ is $\text{Tan}^{-1}\frac{\sqrt{S_{11}}}{x_1+a}$.

Exercise-A

1. The focus of the parabola $8x^2 = y$ is

1) $\left(0, \frac{1}{4}\right)$ 2) $\left(0, \frac{1}{32}\right)$ 3) $\left(\frac{1}{2}, 0\right)$ 4) $(2,0)$

2. The vertex of the parabola $y^2 = 5x + 4y + 1$ is

1)(-1,2) 2)(1,-2) 3)(0,3) 4)(2,-2)

3. The directrix of the parabola $y^2 = 16x$ is

1)x = 4 2)y = 4 3)y = -4 4)x = -4

4. The focus of the parabola $4y^2 + 12x - 20y + 67 = 0$

1) $\left(\frac{-7}{2}, \frac{5}{2}\right)$ 2) $\left(\frac{-3}{4}, \frac{5}{2}\right)$ 3) $\left(\frac{-17}{4}, \frac{5}{2}\right)$ 4) $\left(\frac{5}{2}, \frac{-3}{4}\right)$

5. The equation of the parabola whose focus is (0,0) and directix is x+y = 4

1) $x^2 + y^2 - 2xy + 8x + 8y - 16 = 0$ 2) $x^2 + y^2 - 2xy + 8x + 8y = 0$

3) $x^2 + y^2 + 8x + 8y - 16 = 0$ 4) $x^2 - y^2 + 8x + 8y - 16 = 0$

6. The equation of parabola whose focus is (0,4) and directrix is y +4 =0 is

1)$y^2 = 16x$ 2) $y^2 = 8x$ 3) $x^2 = 16y$ 4) $x^2 = 8y$

7. The equation of the parabola whose foucs is (0,0) and directrix is $x+y=4$, is

1) $x^2+y^2-2xy+8x+8y-16=0$ 2) $x^2+y^2-2xy+8x+8y=0$

3) $x^2+y^2+8x+8y-16=0$ 4) $x^2-y^2+8x+8y-6=0$

8. The focus of the parabola $8x^2=y$ is

1) (0, 1/4) 2) (0, 1/32) 3) (1/2,0) 4) (2,0)

9. The vertex of the parabola $y^2= 5x+4y+1$ is

1)(-1,2) 2) (1,-2) 3) (0,3) 4) (2,-2)

10. The axis of the parabola $2x^2+5y-3x+4=0$ is

1)x=3/4 2) y=3/4 3) x=-1/2 4) x-3y=5

11. The directrix of the parabola $y^2=16x$ is

1)x=4 2) y=4 3) y=-4 4) x=-4

12. The focus of the parabola $4y^2+12x-20y+ 67=0$

1) (-7/2, 5/2) 2) (-3/4, 5/2) 3) (-17/4,5/2) 4) (5/2,-3/4)

13. The vertex and focus of parabola $(x-2)^2 = -8(y-4)$ are

1)(2,4) ,(4,4) 2) (2,4),(0,4) 3) (2,4),(2,6) 4) (2,4),(2,2)

14. The vertex and the latus rectum of the parabola $y^2-4x+9=0$

1) (-9,0) ; 4 2) (-9/4,0) ; 4 3) (-1,0) ;2 4) (0,0);4

15. The latus rectum of the parabola $y^2=5x+4y+1$ is

1)5/4 2) 10 3) 5 4) 45/2

16. The length of latusrectum of parabola $x^2 - 6x+16y +25 = 0$ is

1)5 2)4 3)16 4)5/3

17. The latusrectum of the parabola $13[(x-3)^2 +(y-4)^2] = (2x-3y +5)^2$

1)$2/\sqrt{13}$ 2)$4/\sqrt{13}$ 3)$1/\sqrt{13}$ 4) $5/\sqrt{13}$

18. If (0,4) and (0,2) are respectively the vertex and the focus of a parabola, then its equation is

1) $x^2+8y=32$ 2) $y^2+8x=32$ 3) $x^2-8y=32$ 4) $y^2-8x=32$

19. Equation of the parabola whose vertex is (-1,-2) axis is vertical and which passes through the point (3,6) is

1)$x^2+4x+28y-136=0$ 2) $x^2+2x-2y-3=0$ 3) $y^2+4y-16x-12=0$ 4) $x^2+2x+2y+3=0$

20. The angle subtended by the double ordinate of length 8a of the parabola $y^2=4ax$ at thevertex is

1) $\pi/4$ 2) $\pi/3$ 3) $\pi/2$ 4) $\pi/6$

21. If $2x+y+a=0$ is a focal chord of the parabola $y^2=-8x$, then a
1)2 2) -2 3)4 4)-4

22. Which of the following equations represents a parabola
1) $(x-y)^3=3$ 2) $x/y-y/x=0$ 3) $x/y+4/x=0$ 4) $(x+y)^2+3=0$

23. The focus of the parabola $(x-\alpha)^2 = 4a(y-\beta)$ is
1)(α, β) 2) $(\alpha, a+\beta)$ 3) $(a+\alpha, \beta)$ 4) $(a+\alpha, 0)$

24. The focal distance of point on the parabola $y^2=8x$ is 10. The coordinates of that point are
1)(8,8) 2) (-8,8) 3) (8,2) 4) (-8,2)

25. The coordinates of the point on the parabola $y^2=2x$ whose focal distance is 5/2 are
1) (2,4) 2) (-2,4) 3) (-2,2) 4) (2,-2)

26. The point on the parabola $y^2=36x$ whose ordinate is three times its abscissa, is
1) (4,12) 2) (3,9) 3)(0,0) 4) (1,3)

27. The line $y=2x+1$ touches the parabola
1)$y^2=4x$ 2)$y^2=8x+2$ 3)$y^2=8x$ 4)$y^2=4x+4$

28. A tangent is drawn to the parabola $y^2=4x$ through (-2,1).Then the point of contact is
1)(2,1) 2)(1,2) 3)(1,-2) 4)$(2, \sqrt{2})$

29. The line $y=mx+\sqrt{a^2m^2+b^2}$ is a tangent to the
1)parabola $y^2=4ax+b$ 2)ellipse $x^2/a^2+y^2/b^2=1$
3)hyperbola $x^2/a^2-y^2/b^2=1$ 4)not a tangent to any conic

30. Equation of the normal to the parabola $y^2=4x$ which is parallel to the line $y=2x-5$ is
1) $y=2x$ 2) $y=2x-12$ 3) $y=2x-10$ 4) $y=2x+4$

31. Equation of the normal to the parabola $y^2=4x$ which is perpendicular to the line $x+3y+1=0$ is
1)$3x-y+1=0$ 2) $3x-y-33=0$ 3) $3x-y-23=0$ 4) $3x-y+23=0$

32. If (2,0) is the vertex and y–axes is the directrix of a parabola, then its focus is
1) (2,0) 2) (-2,0) 3) (4,0) 4) (-4,0)

33. The straight line $x+y=k+1$ touches the parabola $y=x(1-x)$ if
1)k-1 2) k=0 3) k=1 4) k takes any real value

34. If a line y=mx+a meets the parabola y^2=4ax in two points whose abscissae are $x_1$and x_2, then $x_1+x_2=0$ if
1) m=-1 2) m=1 3) m=2 4) m=-1/2

35. Perpendiculars are drawn on a tangent to the parabola y^2=4ax from the points (a +k,0) . Then the difference of their squares is
1)4 2) 4a 3) 4k 4) 4ak

36. The equation of the normal to the parabola y^2=20x at the point (5,10) is
1) x+y-15=0 2) x+y-5=0 3) x-y+15=0 4) x-y+5=0

37. The line x+y=6 is a normal to the parabola , y^2=8x at the point
1)(18,-12) 2) (4,2) 3) (2,4) 4) (3,3)

38. On the parabola y^2 = 8x if one extremity of focal chord is (1/2 , -2) then its other exrimity is
1)(2 ,2) 2) (1/8 ,-8) 3) (8,1/8) 4) (8 ,8)

39. The number of tangents that can be drawn to the parabola y^2=6x through (0,0) is
1)0 2) 1 3)2 4)3

40. The number of tangents that can be drawn to the parabola y^2=8x through (2,3) is
1)0 2) 1 3)2 4)3

41. The equation of the tangent to the parabola x^2-4x-8y+12=0 at (4,3/2) is
1)x+2y-1=0 2) x+2y+1=0 3) x-2y+1=0 4) x-2y-1=0

42. The equation of the tangent to the parabola y^2=6x at the positive end of the latus rectum is
1) 2x-2y=3 =0 2) 2x+2yy+3=0 3) y=4 4) y+4=0

43. The latus rectum of the parabola $y^2 = 5x + 4y + 1$ is
1) $\frac{5}{4}$ 2)10 3)5 4) $\frac{5}{2}$

44. Which of the following equations represents a parabola
1) $(x-y)^3 = 0$ 2) $\frac{x}{y} - \frac{y}{x} = 0$ 3) $\frac{x}{y} + \frac{4}{x} = 0$ 4) $(x+y)^2 + 3 = 0$

45. A tangent is drawn to the parabola $y^2 = 4x$`through $(-2,1)$,Then the point of contact is
1)parabola $y^2 = 4ax$`+b 2)ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

3)hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ 4)not a tangent to any conic

46. The equation of the normal to the parabola $y^2=20x$ at the point $(5,10)$ is
1) $x+y-15=0$ 2) $x-y-5=0$
3) $x-y+15=0$ 4) $x-y+5=0$

47. The equation of the tangent to the parabola $y^2=6x$ at the positive end of the latus rectum is
1) $2x-2y+3=0$ 2) $2x+2y+3=0$ 3) $y=4$ 4) $y+4=0$

48. The equations of common tangents to the parabola $y^2=8x$ and the circle $x^2+y^2-12x+4=0$ are
1) $x=\pm(y+2)$ 2) $x=\pm(y-2)$ 3) $y=\pm(x+2)$ 4) $y=\pm(x-2)$

49. The equation of the normal to the parabola $y^2=8x$ at $(2,4)$ on it is
1) $x+y+6=0$ 2) $x+y-6=0$ 3) $x-y+6=0$ 4) $x-y-6=0$

50. The pole of the straight line 2x+3y+4 =0 with respect to the parabola $y^2=8x$ is
1) $(2,6)$ 2) $(-2,6)$ 3) $(2,-6)$ 4) $(-2,-6)$

51. The condition for the line y=mx+c to be a tangent to the parabola $x^2=4ay$ is
1) c= a/m 2) c/am 3) $c=am^2$ 4) $c=-am^2$

52. The equations of common tangents to the circle $x^2+y^2=2a^2$ and the parabola $y^2=8ax$ are
1)y=±(x-2a) 2) y=±(x+2a) , 3) x=±(y+2a) 4) x=±(y-2a)

53. The eqn of common tangents to the parabola $y^2=8x$ and the circle $x^2+y^2-12x+4=0$ are
1) x=±(y+2) 2) x=±(y-2) 3) y=±(x+2) 4) y=±(x-2)

54. The equation of the normal to the parabola $y^2=8x$ at (2,4) on it is
1)x+y+6=0 2) x+y-6=0 3) x-y+6=0 4) x-y-6=0

55. The locus of the foot of the ⊥ar drawn from the focus upon the tangent of a parabola, is
1) tangent at vertex 2) normal at the vertex 3) axis of the parabola 4) directrix

56. The locus of the mid point of the chords of the parabola $y^2 = 4ax$ parallel to y=mx, is
1) y=2a 2) y=1/m 3) y=2a/m 4) y=a/m

57. The focal distance of point (9,6) on parabola $y^2=4x$ is
1)4 2)8 3)10 4)16

58. Locus of the middle points of all chords of the parabola $y^2=4x$ which are drawn through vertex is
1)$y^2=8x$ 2) $y^2=2x$ 3) $x^2+4y^2=16$ 4) $x^2=2y$

59. The length of the chord of the parabola $y^2=4ax$ whose equation is $y-x\sqrt{2}+4a\sqrt{}=0$ is
1)$2\sqrt{11}$ a 2) $4\sqrt{2}$ a 3) $8\sqrt{2}$a 4) $6\sqrt{3}$a

60. If the normal of the parabola at the points t_1 and t_2 intersect on the parabola then
1)$t_1t_2=1/2$ 2) $t_1t_2=1$ 3) $t_1t_2=-1$ 4) $t_1t_2=2$

61. If the chord joining the points t_1,t_2 on the parabola $y^2=4ax$ passes through the focus, then
1) $t_1t_2=1$ 2) $t_1t_2=-1$ 3) $t_1t_2=2$ 4) $t_1t_2=-2$

62. Match the following.

Focus,directrix	Equation of the parabola
I. (2,0),x+2=0	a)$x^2+8y=0$
II. (0,-2),y-2=0	b)$y^2=8x$
III. (1,2),x+2y+5=0	c)$4x^2 -4xy+y^2-20x-40y=0$

1)a,b,c 2)b,c,a 3)c,a,b 4)b,a,c

63. A: If the focus (1,-1) and directrix is x+2y-9=0 then the vertex of the parabola is (2,1).
R: Vertex of a parabola is the image of the focus with respect to the directrix.
1)Both A and r are true and R is the correct explanation of A
2) Both A and R are true but R is not correct explanation of A
3)A is true but R is false 4)A is false but r is true

PREVIOUS EAMCET PAPER'S PROBLEMS

64 The vertex of the parabola $x^2+12x-9y=0$ is (2000)
1)(-4,1) 2)(4,-1) 3)(-4,-1) 4)(4,1)

65. The line 4x+6y+9=0 touches the parabola $y^2 =4x$ at the point (2000)
1)-3,9/4) 2)(3,-9/4) 3)(9/4,-3) 4)(-9/4,-3)

66. The length of the latus rectum of the parabola $y^2+8x-2y+17=0$ is (2001)
1)2 2)4 3)8 4)16

67. If the normal to the parabola $y^2=4x$ at P(1,2) meets the parabola again in Q, then Q=__
1)(-6,9) 2)(9,-6) 3)(-9,-6) 4)(-6,-9) (2001)

68. The parabola with directrix x+2y-1=0 and focus(1,0)is (2005)
1)$4x^2-4xy+y^2-8x+4y+4=0$ 2)$4x^2+4xy+y^2-8x+4y+4=0$
3)$4x^2+4xy+y^2-8x-4y+4=0$ 4)$4x^2-4xy+y^2-8x-4y+4=0$

69. The line among the following , that touches the parabola $y^2=4ax$ is: (2005)
1)$x+my+am^3=0$ 2)$x-my+am^2=0$ 3)$x+my-am^2=0$ 4)$y+mx+am^2=0$

70. If the lines 2x+3y+12=0 and x-y+4k=0 are conjugate with respect to the parabola $y^2=8x$, then the value of k is (2006)
1)-3 2)3 3)2 4)-2

71. Let o be the origin and A be a point on the curve $y^2=4x$. Then ther locus of the mid point of OA is (2006)
1) $x^2= 4y$ 2) $x^2= 2y$ 3) $y^2= 16x$ 4) $y^2=2x$

72. For the parabola $y^2 +6y -2x +5 =0$
I) The vertex is (-2,-3) II)The directrix is y +3 =0
Which of the followingt is correct ? (2007)
1)Both I & II are true 2)I is true, II is false 3)I is false, II is true 4)Both I & II are false

73. If $2x + 3y + 12=0$ and $x - y+4\lambda = 0$ are conjugate with respect to the parabola $y^2 = 8x$, then $\lambda =$ [2008]
1) 2 2) –2 3) 3 4) –3

74. The number of normals drawn to the parabola $y^2 = 4x$ from the point (1,0) is: [2009]
1) 0 2) 1 3) 2 4) 3

75. Let M be the foot of the perpendicular from a point P on the parabola $y^2 = 8(x-3)$ onto its directrix and last S be the focus of the parabola. If ΔSPM is an equilateral triangle, then P = (2010)
1) $(4\sqrt{3},8)$ 2) $(8,4\sqrt{3})$ 3) $(9,4\sqrt{3})$ 4) $(4\sqrt{3},9)$

76. If the lines 2x+3y+12=0, x–y+k=0 are conjugate w.r.to the parabola $y^2=8x$, then k = [2010]
1) 10 2) 7/2 3) -12 4) -2

77. If a chord of the parabola $y^2 = 4x$ passes through its focus and makes an angle θ with the X-axis, then its length is [2011]
1) $4\cos^2\theta$ 2) $4\sin^2\theta$ 3) $4\cos ec^2\theta$ 4) $4\sec^2\theta$

78. If the straight line y = mx + c is parallel to the axis of the parabola $y^2 = lx$ and intersects the parabola at $\left(\frac{c^2}{8},c\right)$ then the length of the latus rectum is [2011]
1) 2 2) 3 3) 4 4) 8

79. If the line $2x + 5y = 12$ intersects the ellipse $4x^2 + 5y^2 = 20$ in two distinct points A & B, then the midpoint of AB is [2012]
1) (0, 1) 2) (1, 2) 3) (1, 0) 4) (2, 1)

80. A circle of radius 4, drawn on a chord of the parabola $y^2 = 8x$ as diameter, touches the axis of the parabola. Then, the slope of the chord is [2013]
1) $\frac{1}{2}$ 2) $\frac{3}{4}$ 3) 1 4) 2

81. If a normal chord at a point t on the parabola $y^2 = 4ax$ subtends a right angle at the vertex, then t = (2014)
1) $\sqrt{2}$ 2) 2 3) $\sqrt{3}$ 4) 1

82. The slopes of the focal chords of the parabola $y^2 = 32x$ which are tangents to the circle $x^2 + y^2 = 4$ are (2014)
1) $\frac{1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}$ 2) $\frac{1}{\sqrt{15}}, \frac{-1}{\sqrt{15}}$ 3) $\frac{2}{\sqrt{5}}, \frac{-1}{\sqrt{5}}$ 4) $\frac{1}{2}, \frac{-1}{2}$

83. The equation of the parabola with focus (1, -1) & directrix $x + y + 3 = 0$ is (2015)
1) $x^2 + y^2 - 10x - 2y - 2xy - 5 = 0$ 2) $x^2 + y^2 - 10x - 2y - 2xy - 5 = 0$
3) $x^2 + y^2 + 10x + 2y - 2xy - 5 = 0$ 4) $x^2 + y^2 + 10x + 2y + 2xy - 5 = 0$

84. If P is a point on the parabola $y^2 = 8x$ & A is the point (1, 0), then the locus of the midpoint of the line segment AP is (2015)
1) $y^2 = 4\left(x - \frac{1}{2}\right)$ 2) $y^2 = 2(2x + 1)$ 3) $y^2 = x - \frac{1}{2}$ 4) $y^2 = 2x + 1$

85. An equilateral triangle is inscribed in the parabola $y^2 = 8x$, with one of its vertices is the vertex of the parabola, then the length of the side of that triangle is (2015 A.P)
1) $24\sqrt{3}$ 2) $16\sqrt{3}$ 3) $8\sqrt{3}$ 4) $4\sqrt{3}$

86. The points (3, 4) is the focus & $2x - 3y + 5 = 0$ is the directrix of a parabola. Its latus rectum is (2015 A.P)
1) $\frac{2}{\sqrt{13}}$ 2) $\frac{4}{\sqrt{13}}$ 3) $\frac{1}{\sqrt{13}}$ 4) $\frac{3}{\sqrt{13}}$

87. From a point (C, 0) three normals are drawn to the parabola $y^2 = x$. Then (2016)
1) $C < 1/2$ 2) $C = 1/2$ 3) $C > 1/2$ 4) $1/2 > C > 1/4$

88. The points of intersection of the parabola $y^2 = 5x$ & $x^2 = 5y$ lie on the line (2016)
1) $x + y = 10$ 2) $x - 2y = 0$
3) $x - y = 0$ 4) $2x - y = 0$

89. If (x_1, y_1) & (x_2, y_2) are the end points of a focal chord of the parabola $y^2 = 5x$, then $4x_1x_2 + y_1y_2 =$ (2016AP)

1) 25 2) 5 3) 0 4) $\frac{5}{4}$

90.For the parabola $y^2 + 6y - 2x = -5$ (2017)

I) The vertex is (-2, -3) II) The directrix is $y + 3 = 0$

Which of the following is incorrect?

1) Both I & II are correct 2) I is true, II is false

3) Both I & II are false 4) I is false, II is true

91.A = (-2, 0) & P is a point on the parabola $y^2 = 8x$. If Q bisects $\overline{AP}$ & the locus of Q iss a parabola, then its focus is (2017AP)

1) (0, 0) 2) (1, 1) 3) (5, 0) 4) (4, 0)

92. Let S be the focus of the parabola $y^2 = 4ax$ & PQ be a focal chord such that SP = α & SQ = α'. Then $\frac{1}{\alpha}+\frac{1}{\alpha'}=$ (2017AP)

1) a 2) a^2 3) $\frac{1}{a}$ 4) $\frac{1}{a^2}$

93. If the line $x - y = -4k$ is a tangent to the parabola $y^2 = 8x$ at P, then the perpendicular distance of normal at P from (K, 2K) is (2017)

1) $\frac{5}{2\sqrt{2}}$ 2) $\frac{7}{2\sqrt{2}}$ 3) $\frac{9}{2\sqrt{2}}$ 4) $\frac{1}{2\sqrt{2}}$

KEY

1) 1	2) 2	3) 4	4) 3	5) 1	6) 3	7) 1	8) 2	9) 1	10) 4
11) 3	12) 4	13) 2	14) 3	15) 3	16) 3	17) 1	18) 2	19) 3	20) 2
21) 3	22) 3	23) 2	24) 1	25) 4	26) 1	27) 3	28) 3	29) 2	30) 3
31) 2	32) 3	33) 2	34) 3	35) 4	36) 1	37) 3	38) 4	39) 2	40) 1
41) 4	42) 1	43) 3	44) 3	45) 2	46) 4	47) 1	48) 3	49) 4	50) 3
51) 4	52) 2	53) 3	54) 2	55) 1	56) 3	57) 3	58) 2	59) 4	60) 4
61) 2	62) 4	63) 3	64) 3	65) 1	66) 3	67) 3	68) 1	69) 3	70) 1
71) 4	72) 2	73) 4	74) 2	75) 3	76) 3	77) 4	78) 1	79) 2	80) 3
81) 1	82) 2	83) 1	84) 1	85) 2	86) 1	87) 3	88) 3	89) 3	90) 2
91) 1	92) 3	93) 3	94)	95)	96)	97)	98)	99)	100)

Exercise-B

1. Equation of the parabola whose vertex is (-1,-2) axis is vertical and which passes through the point (3,6) is

1)$x^2+4x+28y-136=0$ 2) $x^2+2x-2y-3=0$

3) $y^2+4y-16x-12=0$ 4) $x^2+2x+2y+3=0$

2. The angle subtended by the double ordinate of length 8a of the parabola $y^2=4ax$ at thevertex is

1) $\pi/4$ 2) $\pi/3$ 3) $\pi/2$ 4) $\pi/6$

3. A tangent is drawn to the parabola $y^2=4x$ through (-2,1).Then the point of contact is

1)(2,1) 2)(1,2) 3)(1,-2) 4)(2, $\sqrt{2}$)

4. The line $y = mx + \sqrt{a^2m^2 + b^2}$ is a tangent to the

1)parabola $y^2=4ax+b$ 2)ellipse $x^2/a^2+y^2/b^2=1$

3)hyperbola $x^2/a^2-y^2/b^2=1$ 4)not a tangent to any conic

5. If a line y=mx+a meets the parabola $y^2=4ax$ in two points whose abscissae are $x_1$and x_2, then $x_1+x_2=0$ if

1) m=-1 2) m=1 3) m=2 4) m=-1/2

6. Perpendiculars are drawn on a tangent to the parabola $y^2=4ax$ from the points (a +k,0) . Then the difference of their squares is

1)4 2) 4a 3) 4k 4) 4ak

7. The equations of common tangents to the circle $x^2+y^2=2a^2$ and the parabola $y^2=8ax$ are

1)y=$\pm$(x-2a) 2) y=$\pm$(x+2a) , 3) x=$\pm$(y+2a) 4) x=$\pm$(y-2a)

8. The eqn of common tangents to the parabola $y^2=8x$ and the circle $x^2+y^2-12x+4=0$ are

1) x=$\pm$(y+2) 2) x=$\pm$(y-2) 3) y=$\pm$(x+2) 4) y=$\pm$(x-2)

9. The equation of the normal to the parabola $y^2=8x$ at (2,4) on it is

1)x+y+6=0 2) x+y-6=0 3) x-y+6=0 4) x-y-6=0

10. The locus of the foot of the $\perp$ar drawn from the focus upon the tangent of a parabola, is

1) tangent at vertex 2) normal at the vertex

3) axis of the parabola 4) directrix

11. The locus of the mid point of the chords of the parabola $y^2 = 4ax$ parallel to y=mx, is

1) y=2a 2) y=1/m 3) y=2a/m 4) y=a/m

12 The vertex of the parabola $x^2+12x-9y=0$ is (2000)

1)(-4,1) 2)(4,-1) 3)(-4,-1) 4)(4,1)

13. The line 4x+6y+9=0 touches the parabola y^2 =4x at the point

1)-3,9/4) 2)(3,-9/4) 3)(9/4,-3) 4)(-9/4,-3)

14. The length of the latus rectum of the parabola $y^2+8x-2y+17=0$ is
1)2 2)4 3)8 4)16

15. If the normal to the parabola $y^2=4x$ at P(1,2) meets the parabola again in Q, then Q=
1)(-6,9) 2)(9,-6) 3)(-9,-6) 4)(-6,-9)

KEY

1) 2	2) 3	3) 3	4) 2	5) 3	6) 4	7) 2	8) 3	9) 2	10) 1
11) 3	12) 1	13) 3	14) 3	15) 2	16)	17)	18)	19)	20)

AIEEE

1. If the normal at the point t on a parabola $y^2 = 4ax$ meet it again at t_1, then t_1 = [AIEEE 2003]
1) t 2) –t – 1/t 3) –t – 2/t 4) none

2. If $a \neq 0$ and the line $2bx + 3cy + 4d = 0$ passes through the points of intersection of the parabola $y^2 = 4ax$ and $x^2 = 4ay$, then [AIEEE 2004]
1) $d^2 + (2b+3c)^2 = 0$ 2) $d^2 + (3b-2c)^2 = 0$
3) $d^2 + (2b-3c)^2 = 0$ 4) $d^2 + (3b+2c)^2 = 0$

3. The locus of the vertices of the family of parabola $y = \frac{a^2x^2}{3} + \frac{a^2x}{2} - 2a$ is [AIEEE 2006]
1) $xy = \frac{35}{16}$ 2) $xy = \frac{64}{105}$ 3) $xy = \frac{105}{64}$ 4) $xy = \frac{3}{4}$

4. The equation of a tangent to the parabola $y^2 = 8x$ is y = x + 2. The point on this line from which the other tangent to the parabola is perpendicular to the given tangent is [AIEEE 2007]
1) (-1, 1) 2) (0, 2) 3) (2, 4) 4) (-2, 0)

KEY

1) 3	2) 1	3) 3	4) 4

14. ELLIPSE

1. An ellipse is the set of points in a plane, the distance of each of which from the focus is (<1) times the distance from the directrix.

2. Equation of Ellipse in the standard form is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

3. If $a > b$, for the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, major axis is x-axis, $y = 0$, minor axis is along y-axis *i.e.* $x = 0$, the focus $(ae, 0)$ and $(-ae, 0)$ the ventrices $(a, 0)$ and $(-a, 0)$. The parametric equations are $x = a \cos \theta$, $y = b \sin \theta$.

4. The latus rectum of ellipse $\frac{2b^2}{a}$

5. The equation of pair of tangents from an external point (x_1, y_1) is $S_1^2 = S\, S_{11}$.

6. Equation of polar of any point (x_1, y_1) is $S_1 = 0$.

7. The equation of the chord joining two points (x_1, y_1) and (x_2, y_2) on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is $S_1 + S_2 = S_{12}$.

8. The line $y = mx + c$ is tangent to $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ if $c^2 = a^2m^2 + b^2$.

9. The equation of any tangent to the ellipse is $y = mx \pm \sqrt{a^2m^2+b^2}$

10. The line $lx + my + n = 0$ is tangent to the ellipse if $a^2l^2 + b^2m^2 = n^2$.

11. If the line $lx + my + n = 0$ is a tangent to the ellipse then the point of contact is $\left(-\frac{a^2l}{n}, -\frac{b^2m}{n}\right)$

12. The equation of normal at the point (x_1, y_1) for the ellipse is $\frac{a^2x}{x_1}-\frac{b^2y}{y_1}=a^2-b^2$

13. The line $lx + my + n = 0$ is normal to ellipse if $\frac{a^2}{l^2}+\frac{b^2}{m^2}=\frac{(a^2-b^2)^2}{n^2}$

14. Pole of the straight line $lx + my + n = 0$ for ellipse $\left(\frac{-a^2l}{n}, \frac{-b^2m}{n}\right)$

15. Notation

i. $S = 0 \Rightarrow x^2 / a^2 + y^2 / b^2 = 1$

ii. $S_1 = 0 \Rightarrow xx_1 / a^2 + y^2 / b^2 = 1$

iii. $S_{11} = \Rightarrow x_1^2 / a^2 + y_1^2 / b^2 = 1$

iv. $S_{12} \Rightarrow x_1x_2 / a^2 + y_1y_2 / b = 1$

16. Two tangents can be drawn to an ellipse from an external point.

17. The locus of the point of intersection of perpendicular tangents of an ellipse is a circle concentric with the ellipse. It is known as the director circle.

18. The equation of the director circle of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is $x^2 + y^2 = a^2 + b^2$.

19. The locus of the feet of the perpendicular drawn from the foci to any tangents of the ellipse is a circle concentric with the ellipse. It is known as the auxiliary circle.

20. The equation to the auxiliary circle of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is $x^2 + y^2 = a^2 (a>b)$

21. The equation of the chord of contact of the point $P(x_1, y_1)$ w.r.t ellipse $S = 0$ is $S_1 = 0$.

22. The line $lx + my + n = 0$ meets the ellipse in P and Q . The mid point of PQ is $\left(\frac{-a^2 \ln}{a^2 l^2 + b^2 m^2}, \frac{-bmn}{a^2 l^2 + b^2 m^2} \right)$

23. **Eccentric angle:** Let P be a point on an ellipse with center C and NP be the ordinate of P.Let NP meets the auxiliary circle in P^1. If $\angle NCP^1 = \theta$ is called the eccentric angle of P. The point P^1 is called the corresponding point of P.

24. The point $P(a \cos \theta, b\sin\theta)$ traces the ellipse for all $0 \le \theta \le 2\Pi$. P is denoted by the parameter 'θ'. Hence parametric equations of ellipse are c a cosθ, y = bsinθ. The corresponding point $P^1 = (a \cos\theta , a \sin\theta)$.

25. The equation of the chord joining the points with eccentric angles α and β on the ellipse is $\frac{x}{a}\cos\frac{\alpha+\beta}{2} + \frac{y}{b}\sin\frac{\alpha-\beta}{2} = \cos\frac{\alpha-\beta}{2}$

26. If α and β are the ends of focal chord then $\cos\frac{\alpha+\beta}{2} = \cos\frac{\alpha-\beta}{2}$

27. The equation of the tangents p(θ) on the ellipse is $\frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta = 1$

28. If m_1, m_2 are the slope of the tangents thorugh $P(x_1, y_1)$ to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ then $m_1 + m_2 = \frac{2x_1y_1}{x^2{}_1 - a^2}$; $m_1m_2 = \frac{y_1^2 - b^2}{x_1^2 - a^2}$.

EXERCISE-A

1. An ellipse with the eccentricity e=1/2 has a focus at (0,0) and the corresponding directrix is x+6=0. The equation of the ellipse is
1)$3x^2+4y^2+12x-36=0$ 2)$3x^2+4y^2-12x+36=0$ 3)$3x^2+4y^2-12x-36=0$ 4)none

2. The equation of the ellipse whose foci are (± 3,0) and eccentricity 3/4 is
1)$x^2/16+y^2/9=1$ 2)$x^2/16+y^2/7=1$ 3)$x^2/9+y^2/16=1$ 4)$x^2/7+y^2/16=1$

3. I: The equation of the ellipse whose focus is (3,-2), eccentricity 3/4 and directrix 2x-y+3=0 is $44x^2+36xy+71y^2-588x+374y+959=0$
II: The eccentricity of an ellipse, with its centre at the origin, is 1/2 If one of the directrices is x=4, then the equation of the ellipse is $3x^2+4y^2=12$
1)only I is true 2)only II is true
3)both I and II are true 4)neither I nor II true

4. Match the following.

Focus, eccentricity, directrix	Equation of the ellipse
I.(0,0),1/2,x+6=0	a)$3x^2+4y^2=12$
II. (1,0),1/2,x-4=0	b)$32x^2+36y^2=1$
III.(2,0),1/3,x-18=0	c)$20x^2+36y^2=45$
IV.(0,1)2/3,4y-9=0	d)$3x^2+4y^2-12x-36=0$

1)a,b,c,d 2)a,c,d,d 3)d,a,b,c 4)c,d,b,a

5. If e is the eccentricity of the ellipse $x^2/a^2+y^3/b^2=1$; (a>b) then e^2
1) $(b^2+a^2)/a^2$ 2) $(b^2-a^2)/a^2$ 3) $(a^2-b^2)/b^2$ 4) $(a^2-b^2)/a^2$

6. If the major axis of an ellipse is three times its minor axis then its eccentricity is
1)2/3 2) √2/3 3) 3 √2/3 4) 2 √2/3

7. The eccentricity of the ellipse $25x^2+ 9y^2-150x -90y+225 =0$ is
1)5/4 2) 1 3) ½ 4) 4/5

8. The latus rectum of an ellipse is equal to half of its minor axis . Then its eccentricity is
1)√3/2 2) √3 /2 3) ½ 4) 1/√2

9. The distance between the foci of the ellipse $5x^2+9y^2=45$ is
1) 4√2 2)2 3) 2√2 4) 4

10. The equation $x^2/2-r + y^2/r-5 +1 =0$ represents an ellipse if
1) r>2 2) r>5 3) 2<r<5 4) r<2 or r>5

11. A bridge is in the shape of a semi ellipse which is 400mts long and has maximum height of 10mts at the middle point. The height of the bridge at a point distant 80 mts from one end is

1)4mts 2) 2 mts 3) 8mts 4) $\sqrt{91}$ mts

12. The foci of the ellipse $25(x+1)^2+9(y+2)^2=225$ are at
1) (-1,2) and (-1,-6) 2) (-2,1) and (-2,6)
3) (-1,-2) and (-2,-1) 4) (-1,-2) and (-1,-6)

13. The latus rectum of the ellipse $5x^2+9y^2=45$ is
1) 5/3 2) 10/3 3) $2\sqrt{5}/3$ 4) $\sqrt{5}/3$

14. The length of the latus rectum of the ellipse $x^2/9 + y^2/16=1$ is
1)9/2 2)7/2 3)32/3 4)8/3

15. If P is a point on the ellipse $x^2/a^2+y^2/b^2=1$; b>a whose foci are S and S', then SP+S'P=
1)2a 2)2ae 3)2b 4)2be

16. The distance of a point on the ellipse $x^2/6+y^2/2=1$ from the centre is 2.The eccentric angle of the point is
1)$\pi/3$ 2)$\pi/5$ 3)$5\pi/4$ 4)$\pi/2$

17. The equation of the tangent to the ellipse $x^2/a^2+y^2/b^2=1$ at the point whose eccentric angle is θ, is
1)$(x\sin\theta)/a+(y\cos\theta)/b=1$ 2)$(x\cos\theta)/a+(y\sin\theta)/b=1$
3)$xa+by=\tan\theta$ 4)$ax+by=\sec\theta$

18. If the straight line y=4x+c is a tangent to the ellipse $x^2/8+y^2/4=1$, then c will be equal to
1)±4 2)±6 3)±1 4)$\pm\sqrt{132}$

19. The total number of real tangents that can be drawn to the ellipse $3x^2+5y^2=32$ and $25x^2+9y^2=450$ passing through (3,5) is
1)0 2)2 3)3 4) 4

20. The normal at an end of a latus rectum of the ellipse $x^2/a^2+ y^2/b^2 =1$ passes through an end of the minor axis if
1) $e^4 +e^2=1$ 2) $e^3+e^2=1$ 3) $e^2+e=1$ 4) $e^3+e=1$

21. y=mx+c is normal to the ellipse $x^2/a^2+y^2/b^2=1$ if c^2 is equal to
1) $(a^2-b^2)^2 / am^2+b^2$ 2) $(a^2-b^2)^2 / a^2m^2$ 3) $(a^2-b^2)m^2 /a^2+b^2m^2$ 4)O

22. If y=x+c is a tangent to the ellipse $9x^2+16y^2 =144$ then c=
1)5 2) 6 3)2 4) 4

23. The equations of tangents to the ellipse $9x^2+16y^2=144$ from the point (2,3) are

1) $(y-3)(x+y-5)=0$ 2) $(x-3)(x-y-5)=0$
3) $(x+y-3)(x-y+5)=0$ 4) $(x+3)(y+4)=0$

24. A straight line intersects with an ellipse at only one point. Then
1)it is a tangent 2) it is not a tangent 3) it is a normal 4) data insufficient

25. The number of tangents that can be drawn to an ellipse perpendicular toa given straight lineis
1)0 2)1 3) 2 4) 3

26. If the straight line $x-y+4=0$ is a tangent to the ellipse $x^2+3y^2=12$, then the point of contact is
1) (3,1) 2) (3,-1) 3) (-3,-1) 4) (-3,1)

27. The straight line $lx+my+n=0$ is a tangent to the ellipse $x^2/a^2+y^2/b^2=1$ if
1)$a^2l^2+b^2m^2=n^2$ 2) $a^2m^2+b^2l^2=n^2$ 3) $a^2n^2+b^2m^2=l^2$ 4) $a^2n^2+b^2l^2=m^2$

28. If the locus of the midpoint of the chords of the ellipse $x^2/a^2+y^2/b^2=1$parallel to $y=mx$ is $y=m_1x$, then
1) $mm_1=b^2/a^2$ 2)$mm_1=-b/a$ 3) $mm_1=-b^2/a^2$ 4) $mm_1=b/a$

29. The locus of the midpoint of the chords of the ellipse $x^2/25+y^2/16=1$ which are parallel to $2x-y-3=0$ is
1)$8x-25y=0$ 2) $x-y=0$ 3) $8x+25=0$ 4) $8x+25y=0$

30. The locus of the middle points of the portion of the tangents of the ellipse $x^2/a^2+y^2/b^2=1$ included between the axis, is the curve
1)$x^2/a^2+y^2/b^2=4$ 2) $a^2/x^2+b^2/y^2=4$ 3) $a^2x^2+b^2y^2=4$ 4) $b^2x^2+a^2y^2=4$

31. The locus of the foot of the perpendicular drawn from the foci of the curve to nay tangent to the ellipse $x^2/a^2+y^2/b^2=1$ is
1) a circle 2) an ellipse 3) a hyperbola 4) not a conic

32. The equation of the chord of the ellipse $x^2/a^2+y^2/b^2=1$ with (x_1,y_1) as the mid point is
1) $xx_1/a^2+yy_1/b^2=x_1^2+y_1^2/a^2+b^2$ 2) $xx_1/a^2+yy_1/b^2=x_1^2/a^2+y_1^2/b^2$
3) $xx_1/a^2+yy_1/b^2-2=x_1^2/a^2+y_1^2/b^2$ 4) $xx_1/a^2+yy_1/b^2=1$

33. The center of the ellipse $4x^2+9y^2-24x+36y-72=0$ is
1)(2,-1) 2) (3,5) 3) (3,-2) 4) (5,3)

34. The center of ellipse $\frac{(x+y-2)^2}{9}+\frac{(x-y)^2}{16}=1$
1) (0,0) 2) (0,1) 3) (1,0) 4)(1,1)

35. The centre of the ellipse $\frac{(2x-3y-1)^2}{16} + \frac{(3x+2y-8)^2}{9} = 1$

1)(1,2) 2)(1,-2) 3)(2,1) 4)(2,-1)

36. If the length of the major axis of an ellipse is four times the length of of its minor axis, then it's eccentricity is

1)1/3 2)√15/4 3)1/√ 2 4)2√2/3

37. If the minor axis of an ellipse subtends an angle 90^0 at each focus then eccentricity of the ellipse is

1)√3/2 2)1/√2 3)2/√3 4) none

38. The pole of the line 2x-y+2=0 w.r.t the ellipse $3x^2+5y^2=15$ is

1)(-5/3,2) 2)(9/2,2) 3)(6,6) 4)(-5,3/2)

39. Match the following.

Ellipse	Director circle
I. $2x^2+3y^2=6$	a)$x^2+y^2=5$
II. $16x^2+9y^2=144$	b)$x^2+y^2=15$
III. $6x^2+9y^2=54$	c)$x^2+y^2=25$

1)a,b,c 2)b,c,a 3)a,c,b 4)c,a,b

40. A : The point (-2,1) lies in the ellipse $3x^2+4y^2+6x-8y-5=0$.

R : The point (x_1,y_1) lies in side the ellipse S=0 iff $s_{11}<0$.

1)Both A and R are true and R is the correct explanation of A

2)Both A and R are true but R is not correct explanation of A

3) A is true but R is false 4)A is false but R is true

41. A: The equation of the auxiliary circle of the ellipse $5x^2+7y^2=35$ is $x^2+y^2=7$.

R: The equation of the auxiliary circle of the ellipse $x^2/a^2+y^2/b^2=1$ when a>b is $x^2+y^2=a^2$.

1)Both A and R are true and R is the correct explanation of A

2)Both A and R are true but R is not correct explanation of A

42 The equation $2x^2+5xy+2y^2=1$ represents

1) a parabola 2) an ellipse 3) a hyperbola 4) a circle

43. The foci of the ellipse $25(x+1)^2+9(y+2)^2=225$ are at

1) $(-1,2)$ and $(-1,-6)$ 2) $(-2,1)$ and $(-2,6)$

3) $(-1,-2)$ and $(-2,-1)$ 4) $(-1,-2)$ and $(-1,-6)$

44. The latus rectum of the ellipse $5x^2+9y^2=45$ is

1) $\frac{5}{3}$ 2) $\frac{10}{3}$ 3) $\frac{2\sqrt{5}}{23}$ 4) $\frac{\sqrt{5}}{3}$

PREVIOUS EAMCET PAPER'S PROBLEMS

45. If P is a point on the ellipse $x^2/a^2 + y^2/b^2 = 1$ whose foci are S,S' then PS+PS'=
1)a 2)2a 3)b 4)2b [1987]

46. If the length of the major axis of an ellipse is three times the length of its minor axis, then it's eccentricity is
1)1/3 2)1/√3 3)1/√2 4)2√2/3 [1990]

47. The eccentricity of the ellipse whose latus rectum is equal to half of its minor axis is
1)3/5 2)2/3 3)1/√2 4) √7/4 [1990]

48. The latus rectum of an ellipse is 1/3 of the major axis. It's eccentricity is
1)2/3 2) √2/3 3)5x 4x $3/7^3$ 4)$(3/4)^4$ [1991]

49. S and T are the foci of an ellipse and B is an end of the minor axis. If STB is an equilateral triangle then the eccentricity of the ellipse is [1992]
1)1/4 2)1/3 3)1/2 4)2/3

50. Tangents are drawn through the point (4, √3) to the ellipse $x^2/16+y^2/9=1$. The Points at which these tangents touch the ellipse are [1992]
1)(2,3√3/2),(4,0) 2)(2, √3/√2),(4, √3/2) 3)(4,3√3/√3),(2,0) 4)(2,0)(4,0)

51. Pole of the line 2x+3y+4=0 w.r.t. the ellipse $x^2/2 + y^2/4=1$ is [1993]
1)(1,3) 2)(1,-3) 3)(-1,3) 4)(-1.-3)

52. The centre of the ellipse $\frac{(x+y-2)^2}{9} + \frac{(x-y)^2}{16} = 1$ is [1994]
1)(0,0) 2)(1,1) 3)(1,0) 4)(0,1)

53. In an ellipse the distance between the foci is 6 and it's minor axis is 8. Then its eccentricity is
1)4/5 2)1/√52 3)3/5 4)1/2 [1994]

54.. If the polar with respect to $y^2=4ax$ touches the ellipse $x^2/\alpha^2 + y^2/\beta^2=1$, the locus of its pole is [1995]
1)$x^2/\alpha^2 - y^2/(4a^2\alpha^2/\beta^2) = 1$ 2)$x^2/\alpha^2+y^2/(a^2/\beta^2)=1$
3) $\alpha^2 x^2+\beta^2y^2=1$ 4)none of these

55. The locus of midpoint of a focal chord of the ellipse $x^2/a^2+y^2/b^2=1$ [19 95]
1)$x^2/a^2+y^2/b^2=ex/a$ 2)$x^2/a^2-y^2/b^2=ex/a$ 3)$x^2+y^2=a^2+b^2$ 4)none of these

56 If x/a+y/b=√2 touches the ellipse $x^2/a^2+y^2/b^2=1$, then its eccentric angle 'θ' is equal to
1)0^0 2)90^0 3)45^0 4)60^0 [19 95]

57. The equation of the ellipse whose focus is at (4,0) and whose eccentricity is 4/5 is

1)$x^2/3^2+y^2/52=1$ 2)$x^2/5^2+y^2/3^2=1$ 3)$x^2/5^2+y^2/4^2=1$
4)$x^2/4^2+y^2/5^2=1$[EAMCET 96]

58. The major axis of an ellipse is three times the minor axis, then the eccentricity is
1)$2\sqrt{2}/3$ 2)2/3 3) $\sqrt{2}/3$ 4)1/3 [1996]

59. A circle is descried with minor axis of an ellipse as a diameter. If the foci lie on the circle, the eccentricity of the ellipse is [1996]
1)1/2 2)$1/\sqrt{2}$ 3)1/3 4)$1/\sqrt{3}$

60. The eccentricity of the ellipse $9x^2+4y^2=36$ is [1998]
1) $\sqrt{5}$ 2)5 3)5/3 4) $\sqrt{5}/3$

61. The pole of line x=a/e with respect to the ellipse $x^2/a^2+y^2/b^2=1$ is [1999]
1)(a/e,0) 2)(-a/e,0) 3)(ae,0) 4)(-ae,0)

62. The product of the perpendiculars from the foci an any tangent to the ellipse $x^2/a^2+y^2/b^2=1$ is [2000]

1)a^2 2)a^2-b^2 3)b^2 4) $\sqrt{a^2+b^2}$

63. The eccentricity of the ellipse $\frac{x^2}{9}+\frac{y^2}{16}=1$ is [2001]
1)17/16 2)5/4 3) $\sqrt{7}/4$ 4) $\sqrt{7}/2$

64. The eccentricity of the conic $36x^2+144y^2-36x-96y-199=0$ is [2004]
1)$\sqrt{3}/2$ 2)1/2 3) $\sqrt{3}/4$ 4)$1/\sqrt{3}$

65. Equations of the latus recta of the ellips $9x^24y^2-18x-8y-23=0$ are: (2006)
1)y= $\pm\sqrt{5}$ 2)x= $\pm\sqrt{5}$ 3)y= $1\pm\sqrt{5}$ 4)x=$-1\pm\sqrt{5}$

66. The sides of the rectangle of greatest area that can be inscribed in the ellipse $x^2+4y^2=64$ are:
1)$(6\sqrt{2},4\sqrt{2})$ 2)$(8\sqrt{2},4\sqrt{2})$ 3)$(8\sqrt{2},8\sqrt{2})$ 4)$(16\sqrt{2},4\sqrt{2})$ (2006)

67. The value of k if (1, 2) ,(k,-1) are conjugate points w.r.t. ellipse $2x^2+3y^2 = 6$ is (2007)
1)2 2)4 3)6 4)8

68. For an ellipse whose e=1/2,the centre is the origin.If one Directrix is x=4 then the equation of the ellipse is (2008)
1)$3x^2+4y^2=1$ 2) $3x^2+4y^2=12$ 3) $4x^2+3y^2=1$ 4) $4x^2+3y^2=12$

69. If the distance between the foci of an ellipse is 6 and the length of the minor axis is 8, then the eccentricity is: (2009)

1) $\frac{1}{\sqrt{5}}$ 2) $\frac{1}{2}$ 3) $\frac{3}{5}$ 4) $\frac{4}{5}$

70. The eccentricity of the ellipse $x^2 + 4y^2 + 2x + 16y + 13 = 0$ is [2011]

1) $\frac{\sqrt{3}}{2}$ 2) $\frac{1}{2}$ 3) $\frac{1}{\sqrt{3}}$ 4) $\frac{1}{\sqrt{2}}$

71. If the line $2x + 5y = 12$ intersects the ellipse $4x^2 + 5y^2 = 20$ in two distinct points A & B, then the midpoint of AB is [2012]

1) (0, 1) 2) (1, 2) 3) (1, 0) 4) (2, 1)

72. The midpoint of a chord of the ellipse $x^2 + 4y^2 - 2x + 20y = 0$ is (2, - 4). The equation of the chord is [2013]

1) $x - 6y = 26$ 2) $x + 6y = 26$ 3) $6x - y = 26$ 4) $6x + y = 26$

73. If tangents are drawn from any point on the circle $x^2 + y^2 = 25$ to the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ then the angle between the tangents is (2014)

1) $\frac{\pi}{4}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{2}$ 4) $2\frac{\pi}{3}$

74. An ellipse passing through $\left(4\sqrt{2}, 2\sqrt{6}\right)$ has foci at (-4, 0). Its eccentricity is (2014)

1) $\frac{1}{2}$ 2) $\frac{1}{\sqrt{2}}$ 3) $\frac{1}{\sqrt{3}}$ 4) $\sqrt{2}$

75. For the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$, a list of lines given in List – I are to be matched with their equations given in List – II

List – I	List – II
i) Directrix corresponding to the focus (-3, 0)	a) $y = 4$
ii) Tangent at the vertex (0, 4)	b) $3x = 25$
iii) Latus rectum through (3, 0)	c) $x = 3$
iv) $\left(x^2 + 1\right)\frac{dy}{dx} + 4xy = In\, x$	d) $y + 4 = 0$
	e) $x + 3 = 0$
	f) $3x + 25 = 0$

The correct matching is

	(i)	(ii)	(iii)		(i)	(ii)	(iii)	
1)	(b)	(a)	(e)		2)	(f)	(a)	(c)
3)	(b)	(d)	(c)		4)	(f)	(a)	(e)

76. The centre of the ellipse $\frac{(x+y-3)^2}{9} + \frac{(x-y+1)^2}{16} = 1$ is (2015)

1) (-1, 2) 2) (1, -2) 3) (-1, -2) 4)(1, 2)

77. The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ & having it centre at (0, 3) is (2015 A.P)

1) 6 2) 4 3) 3 4) 2

78. The values that can take so that the straight line y = 4x + m touches the curve $x^2 + 4y^2 = 4$ is (2015 A.P)

1) $\pm\sqrt{45}$ 2) $\pm\sqrt{60}$ 3) $\pm\sqrt{65}$ 4) $\pm\sqrt{72}$

79. For the ellipse given by $(x-3)^2 / 25 + (y-2)^2 / 16 = 1$, match the equation of the lines given in List I with those in the List – II (2016)

List – I	List – II
i) The equation of the major axis	a) 3x = 34
ii) The equation of a directrix	b) y = 2
iii) The equation of a latus rectum	c) x + y = 9
	d) x = 6
	e) x = 3
	f) 3y = 34

The correct matching is

1) i – e; ii – a; iii – d 2) i – b; ii – f; iii – 3
3) i - b; ii – a; iii – e 4) i – b; ii – a; iii – d

80. If S & S' are the foci of the ellipse $x^2 / 25 + y^2 / 16 = 1$ & if PSP' is a focal chord with SP = 8 then SS' = (2016)

1) 4 + S'P 2) S'P – 1 3) 4 + SP 4) SP – 1

81. The distance between the foci of the ellipse $x = 3\cos\theta, y = 4\sin\theta$ is (2016AP)

1) $2\sqrt{7}$ 2) $7\sqrt{2}$ 3) $\sqrt{7}$ 4) $3\sqrt{7}$

82. The equation of the latus recta of the ellipse $9x^2 + 25y^2 - 36x + 50y - 164 = 0$ are (2016AP)

1) x – 4 = 0, x + 2 = 0 2) x – 6 = 0, x + 2 = 0
3) x + 6 = 0, x – 2 = 0 4) x + 4 = 0, x + 5 = 0

83. Let S & S' be the foci of an ellipse & B be one end of its minor axis. If SBS' is an isosceles right angled triangle then the eccentricity of the ellipse is (2017)

1) $\frac{1}{\sqrt{2}}$ 2) $\frac{1}{2}$ 3) $\frac{\sqrt{3}}{2}$ 4) $\frac{1}{3}$

84. The length of the latus rectum of $9x^2 + 25y^2 - 90x - 150y + 225 = 0$ is (2017AP)

1) $\frac{50}{3}$ 2) $\frac{18}{5}$ 3) $\frac{18}{25}$ 4) $\frac{9}{25}$

85. Let C be the centre of an ellipse & PQ be a chord of it with $\angle PCQ = 90^0$. If R is the point of intersection of the tangents to the ellipse at P & Q then R lies on (2017AP)

1) A straight line 2) A parabola 3) An ellipse 4) A hyperbola

86. The foci of the ellipse $25x^2 + 4y^2 + 100x - 4y + 100 = 0$ are (2017)

1) $\left(\frac{5\pm\sqrt{21}}{10},-2\right)$ 2) $\left(-2,\frac{5\pm\sqrt{21}}{10}\right)$ 3) $\left(\frac{5\pm\sqrt{21}}{10},2\right)$ 4) $\left(-2,\frac{2\pm\sqrt{21}}{10}\right)$

KEY

1) **3**	2) **2**	3) **3**	4) **3**	5) **4**	6) **4**	7) **4**	8) **2**	9) **4**	10) **2**
11) **3**	12) **1**	13) **2**	14) **1**	15) **3**	16) **3**	17) **2**	18) **4**	19) **3**	20) **1**
21) **3**	22) **1**	23) **1**	24) **1**	25) **3**	26) **4**	27) **1**	28) **2**	29) **4**	30) **2**
31) **1**	32) **2**	33) **3**	34) **4**	35) **3**	36) **2**	37) **2**	38) **4**	39) **3**	40) **1**
41) **1**	42) **2**	43) **1**	44) **2**	45) **2**	46) **4**	47) **4**	48) **2**	49) **1**	50) **1**
51) **2**	52) **2**	53) **3**	54) **1**	55) **1**	56) **3**	57) **2**	58) **1**	59) **2**	60) **4**
61) **3**	62) **3**	63) **3**	64) **1**	65) **2**	66) **3**	67) **3**	68) **2**	69) **3**	70) **1**
71) **2**	72) **1**	73) **3**	74) **1**	75) **2**	76) **4**	77) **2**	78) **3**	79) **4**	80) **1**
81) **1**	82) **2**	83) **1**	84) **2**	85) **3**	86) **2**	87)	88)	89)	90)

Exercise-B

1. If P is a point on the ellipse $x^2/a^2+y^2/b^2=1$; b>a whose foci are S and S', then SP+S'P=
   1)2a 2)2ae 3)2b 4)2be

2. The normal at an end of a latus rectum of the ellipse $x^2/a^2+ y^2/b^2 =1$ passes through an end of the minor axis if
   1) $e^4 +e^2=1$ 2) $e^3+e^2=1$ 3) $e^2+e=1$ 4) $e^3+e=1$

3. If the locus of the midpoint of the chords of the ellipse $x^2/a^2+y^2/b^2=1$parallel to y=mx is $y=m_1x$, then
   1) $mm_1=b^2/a^2$ 2)$mm_1 =-b/a$ 3) $mm_1=-b^2/a^2$ 4) $mm_1 =b/a$

4. The locus of the midpoint of the chords of the ellipse $x^2/25+y^2/16=1$ which are parallel to 2x-y-3=0 is
   1)8x-25y=0 2) x-y=0 3) 8x+25=0 4) 8x+25y=0

5. The locus of the middle points of the portion of the tangents of the ellipse $x^2/a^2+y^2/b^2=1$ included between the axis, is the curve
   1)$x^2/a^2+y^2/b^2=4$ 2) $a^2/x^2+b^2/y^2=4$ 3) $a^2x^2+b^2y^2=4$ 4) $b^2x^2+a^2y^2=4$

6. The locus of the foot of the perpendicular drawn from the foci of the curve to nay tangent to the ellipse $x^2/a^2+y^2/b^2=1$ is
   1) a circle 2) an ellipse 3) a hyperbola 4) not a conic

7. The equation of the chord of the ellipse $x^2/a^2+y^2/b^2=1$ with (x_1,y_1) as the mid point is
   1) $xx_1/a^2+yy_1/b^2=x_1^2+y_1^2/a^2+b^2$ 2) $xx_1/a^2+yy_1/b^2=x_1^2/a^2+y_1^2/b^2$

3) $xx_1/a^2+yy_1/b^2 -2 = x_1^2/a^2+y_1^2/b^2$ 4) $xx_1/a^2+yy_1/b^2=1$

8. If P is a point on the ellipse $x^2/a^2 +y^2/b^2 =1$ whose foci are S,S' then PS+PS'=
1)a 2)2a 3)b 4)2b

9. If the length of the major axis of an ellipse is three times the length of its minor axis, then it's eccentricity is
1)1/3 2)1/√3 3)1/√2 4)2√2/3

10. The eccentricity of the ellipse whose latus rectum is equal to half of its minor axis is
1)3/5 2)2/3 3)1/√2 4) √7/4

11. The latus rectum of an ellipse is 1/3 of the major axis. It's eccentricity is
1)2/3 2) √2/3 3)5x 4x $3/7^3$ 4)$(3/4)^4$

12. S and T are the foci of an ellipse and B is an end of the minor axis. If STB is an equilateral triangle then the eccentricity of the ellipse is
1)1/4 2)1/3 3)1/2 4)2/3

13. Tangents are drawn through the point (4, √3) to the ellipse $x^2/16+y^2/9=1$. The Points at which these tangents touch the ellipse are
1)(2,3√3/2),(4,0) 2)(2, √3/√2),(4, √3/2) 3)(4,3√3/√3),(2,0) 4)(2,0)(4,0)

14. Pole of the line 2x+3y+4=0 w.r.t. the ellipse $x^2/2 +y^2/4=1$ is
1)(1,3) 2)(1,-3) 3)(-1,3) 4)(-1.-3)

15. In an ellipse the distance between the foci is 6 and it's minor axis is 8. Then its eccentricity is
1)4/5 2)1/√52 3)3/5 4)1/2

16. If the polar with respect to$y^2=4ax$ touches the ellipse $x^2/\alpha^2 +y^2/\beta^2=1$, the locus of its pole is
1) $x^2/\alpha^2 - y^2/(4a^2\alpha^2/\beta^2) =1$ 2)$x^2/\alpha^2+y^2/(a^2/\beta^2)=1$
3) $\alpha^2 x^2+\beta^2y^2=1$ 4)none of these

17. The locus of midpoint of a focal chord of the ellipse $x^2/a^2+y^2/b^2=1$
1)$x^2/a^2+y^2/b^2=ex/a$ 2)$x^2/a^2-y^2/b^2=ex/a$
3)$x^2+y^2=a^2+b^2$ 4)none of these

18. If x/a+y/b=√2 touches the ellipse $x^2/a^2+y^2/b^2=1$, then its eccentric angle 'θ' is equal to
1)0^0 2)90^0 3)45^0 4)60^0

19. The equation of the ellipse whose focus is at (4,0) and whose eccentricity is 4/5 is
1) $x^2/3^2+y^2/52=1$ 2) $x^2/5^2+y^2/3^2=1$ 3) $x^2/5^2+y^2/4^2=1$ 4)$x^2/4^2+y^2/5^2=1$

20. The major axis of an ellipse is three times the minor axis, then the eccentricity is

1)2√2/3 2)2/3 3) √2/3 4)1/3

KEY

1) **3**	2) **1**	3) **2**	4) **4**	5) **2**	6) **1**	7) **2**	8) **2**	9) **4**	10) **4**
11) **4**	12) **1**	13) **1**	14) **2**	15) **3**	16) **1**	17) **1**	18) **3**	19) **2**	20) **2**

AIEEE PROBLEMS

1. The eccentricity of the ellipse with its centre at the origin is ½. If one of the directories is x = 4, then the equation of the ellipse is [2004]

   1) $3x^2+4y^2=1$ 2) $4x^2+3y^2=1$

   3) $4x^2+3y^2=12$ 4) $3x^2+4y^2=12$

2. An ellipse has OB as semi minor axis, F and F' its foci and the angle FBF' is a right angle. Then the eccentric of the ellipse is [2005]

   1) $1/\sqrt{2}$ 2) ½ 3) ¼ 4) $1/\sqrt{3}$

3. In an ellipse the distance between the foci is 6 and its minor axis is 8. Then its eccentricity is

   [2006]

   1) 4/5 2) $1/\sqrt{52}$ 3) 3/5 4) ½

KEY

1) 4	2) 1	3) 3

15. HYPERBOLA

1. A conic section is said to be a hyperbola if its eccentricity is greater than 1.

2. The equation of a hyperbola in the standard form is $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$

3. The eccentricity of a rectangular hyperbola is $\sqrt{2}$.

4. The hyperbolas $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ and $\frac{-x^2}{a^2}+\frac{y^2}{b^2}=1$ are called conjugate hyperbola to each other.

5. If e_1 ;e_2 are the eccentricities of two conjugate hyperbolas then $e^2{}_1+e^2{}_2$.

6. The equation of the chord joining the two points $A(x_1, y_1)$; $B(x_2, y_2)$ on the hyperbola S = 0 is $S_1+S_2=S_{12}$.

7. The equation. of a tangent to the hyperbola $x^2/a^2-y^2/b^2=1$ may be taken as

   $y = mx \pm \sqrt{a^2m^2-b^2}$ The point of contact is $\left(\frac{-a^2m}{c};\frac{-b^2}{c}\right)$.

8. If m_1 ; m_2 are the slopes of the tangents through P to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$

   then $m_1+m_2=\frac{2x_1y_1}{x_1^2-a^2}$; $m_1m_2 = \frac{y^2{}_1+b^2}{x_1^2-a^2}$

9. The equation to the auxiliary circle of $x^2/a^2-y^2/b^2=1$ is $x^2+y^2=a^2$.

10. The pole of the line $lx+my+n=0$ with respect to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is $\left(\frac{-a^2l}{n};\frac{-b^2m}{n}\right)$.

11. The equation of the asymptotes of the hyperbola S =0 are $x/a \pm y/b = 0$.

12. The equation to the pair of asymptotes of $x^2/a^2 - y^2/b^2 - 1$ is $x^2/a^2 - y^2/b^2 = 0$.

13. The angle between the asymptotes of the hyperbola S=0 is $\tan^{-1}(b/a)$ or $2\sec^{-1}(e)$.

14. The equation $x = a\sec\theta$; $y = b\tan\theta$ are called parametric equation of the

hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$

15. Four normals can be drawn from any point to a hyperbola.

16. The condition that the line $lx+my+n=0$ to be normal to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is $\frac{a^2}{l^2}-\frac{b^2}{m^2}=\frac{\left(a^2+b^2\right)^2}{n^2}$

17. The eqn. Of a rectangle hyperbola whose asymptotes are the coordinates axes is $xy=c^2$ are x =ct; y c/t.

18. The eccentricity of $xy=c^2$ is $\sqrt{2}$.

19. The mid point of the chord of the hyperbola if $h^2 > ab$; $abc+2fgh-af^2-bg^2-ch^2 \neq 0$.

20. The mid point of the chord of the hyperbola is $\frac{-a^2 \ln}{a^2l^2-b^2m^2};\frac{b^2mn}{a^2l^2-b^2m^2}$

21. The product of perpendiculars from any point on hyperbola to its asymptotes is $\frac{a^2b^2}{a^2+b^2}$.

22. The angle between the asymptotes of a rectangular hyperbola is $\prod/2$.

23. The equation to the line of asymptotes of the hyperbola $ax^2+2hxy+by^2+2gx+2fy+c=0$ is $ax^2+2hxy+by^2+2gx+2fy+c-\frac{\Delta}{ab-h^2}=0$.

24. The condition that the line $lx+my+n=0$ to be a normal to the hyperbola $x^2/a^2-y^2/b^2=1$ is $\frac{a^2}{l^2}-\frac{b^2}{m^2}=\frac{\left(a^2+b^2\right)^2}{n^2}$

25. Asymptotes of a hyperbola pass through the center of the hyperbola.

Exercise-A

1. The equation to the hyperbola with eccentricity 2 and foci at ($\pm$2,0) is
1)$x^2/4-y^2/9=1$ 2) $x^2-y^2=4$ 3) $x^2/4-y^2/9=1$ 4) $x^2/1-y^2/4$

2. The equation of the hyperbola whose one focus is (2,2) corresponding directrix is 3x-4y=1 and whose eccentricity is 3/2 , is
1)$(x-2)^2+(y-2)^2=9/4\ (3x-4y-1)^2$ 2)$(x-2)^2+(y-2)^2=9/100\ (3x-4y-1)^2$
3)$(x-2)^2+(y-2)^2=9/4\ (3x-4y-1)$ 4)$(x+2)^2+(y+2)^2=9/4\ (3x-4y-1)^2$

3. The equation of the hyperbola whose focus is origin, eccentricity √2 and directrix x+y+1=0 is
1)$15x^2-24xy+8y^2+12x+2y-19=0$ 2)$2xy+2x+2y+1=0$
3)$11x^2+24xy+4y^2-74x-48y+99=0$ 4)$7x^2+12xy-2y2-2x+14y-22=0$

4. Equation of the hyperbola with axes as coordinate axes and transverse axis is 8, conjugate axis 6 is
1) $x^2/8-y^2/6=1$ 2) $x^2/16-y^2/9=1$
3) $x^2/9-y^2/16=1$ 4) $x^2/16-y^2/6=1$

5. Eqn. Of the hyperbola with center at (3,2) and transverse axis is 10 and parallel to x-axis and conjugate axis 8 is
1) $(x-3)^2/16 -(y-2)^2/9 = 1$ 2) $(x-3)^2/9 -(y-2)^2/16 = 1$
3) $(x-3)^2/25 -(y-2)^2/16 = 1$ 4) $(x-3)^2/16 -(y-2)^2/25 = 1$

6. The equation of the hyperbola with vertices (2,5)(2,-1) and eccentricity 4/3 is
1) $(x-2)^2/7 - (y-2)^2/17 = 1$ 2) $(x-2)^2/7 -(y-2)^2/9 = -1$
3) $(x-2)^2/9 -(y-2)^2/7 = 1$ 4) $(x-2)^2/9 -(y-2)^2/25 = 1$

7. The eqn. $\frac{x^2}{7-k}+\frac{y^2}{5-k}=1$ represents a hyperbola if
1) $5<k<7$ 2) $k<5$ or $k>7$ 3) $k>5$ 4) $k \neq 5, k\neq 7$

8. If $\frac{x^2}{12-k}-\frac{y^2}{k-8}=1$ represent a hyperbola then
1) $k<8$ 2) $k>12$ 3)$8<k<12$ 4)$k \pm 5, k\pm 8$

9. The centre of the hyperbola $3x^2-4y^2-24x+40y-88=0$ is
1)(5,4) 2)(-5,4) 3)(4,5) 4)(-4,5)

10. The center of the hyperbola $9x^2-16y^2+72x-32y-16=0$ is
1)(1,1) 2)(1,-1) 3)(-1,1) 4)(-4,-1)

11. The foci of the hyperbola $9y^2-4x^2=36$ are the points
1) $(0,\pm 3)$ 2) $(\pm\sqrt{13},0)$ 3) $(0,\pm\sqrt{13})$ 4) $(\pm 3,0)$

12. The length of the transverse axis of the hyperbola $4x^2-9y^2+8x+40=0$ is
1) $2\sqrt{3}$ 2) $4\sqrt{2}$ 3) 4 4) 6

13. The eccentricity of the hyperbola $9x^2-16y^2=144$ is
1)4/3 2) 5/4 3) 5/4 4) 3/5

14. The eccentricity of the hyperbola $9x^2-16y^2-18x-64y+89=0$ is
1)$5\sqrt{2}$ 2)$5/\sqrt{2}$ 3)5/3 4) $\sqrt{5}/4$

15. The point $(at^2, 2bt)$ lies on the hyperbola $x^2/a^2-y^2/b^2=1$ for
1)all values of t 2) $t^2=2+\sqrt{5}$ 3) $t^2=2-\sqrt{3}$ 4) no real value of t

16. One of the foci of the hyperbola $3x^2-4y^2-24x+40y-88=0$ is
1)$(5,4+\sqrt{21})$ 2)$(4+\sqrt{21},5)$ 3)$(4,5+\sqrt{21})$ 4)$(5+4\sqrt{21},4)$

17. The equation of the asymptotes of the hyperbola $x^2/9-y^2/5=1$ is
1)$x^2/9-y^2/5=-1$ 2)$x^2/9-y^2/5=0$ 3)$x^2/5-y^2/9=0$ 4)$x^2/5-y^2/9=1$

18. The equation of the rectangular hyperbola $xy=c^2$ in the parametric form is
1)$x=at^2, y=2at$ 2)$x=\cos\theta$; $y=c\sin\theta$ 3)$x=ct$; $y=c/t$ 4)$x=c\cos\theta$; $y=c\sin\theta$

19. The normal to the hyperbola $4y^2-5x^2=20$ at (-4,5) is
1)$y-x=9$ 2)$5y-4x=41$ 3)$y+x=9$ 4)$y+x=1$

20. The equation of the tangent to the hyperbola $4y^2=x^2-1$ at the point (1,0) is
1)$x=1$ 2)$y=1$ 3)$y=4$ 4)$x=4$

21. If a tangent to the hyperbola $y^2=ax$ makes an angle 45^0 with X-axis, its point of contact will be
1)(a/2,a/4) 2)(-a/2,a/4) 3)(a/4,a/2) 4)(-a/4,a/2)

22. If $y=mx+6$ is a tangent to the hyperbola $x^2/100-y^2/49=1$ then m=
1)$\sqrt{20}/17$ 2) $\sqrt{17}/20$ 3) $\sqrt{3}/20$ 4) 70

23. The equation of the tangent to the hyperbola $2x^2-3y^2=6$ which is parallel to the line
1) $y=2x+5$ 2) $y=2x-5$ 3) $y=3x+5$ 4) $y=3x+7$

24. The number of tangents to $x^2/9-y^2/4=1$ through (6,2) is
1) 0 2) 1 3)2 4)3

25. The equation of the tangent to the hyperbola $x^2/4-y^2/3=1$ which is perpendicular to $x+2y=0$ is
1) $y=13-2x$ 2) $y=13+2x$ 3) $y=\sqrt{13}-2x$ 4) $y=2x-\sqrt{13}$

26. The line $x\cos\alpha+y\sin\alpha=p$ is a tangent to the hyperbola $x^2/a^2-y^2/b^2=1$ if
1) $a^2\cos^2\alpha+b^2\sin^2\alpha=p^2$ 2) $a^2\cos^2\alpha-b^2\sin^2\alpha=p^2$
3) $a^2\sin^2\alpha+b^2\cos^2\alpha=p^2$ 4) $a^2\sin^2\alpha-b^2\cos^2\alpha=p^2$

27. The equation of the normal to the hyperbola $x^2-3y^2=144$ at the positive end of the latus rectum (first quadrant) is
1) $\sqrt{3}x+2y-32=0$ 2) $\sqrt{3}x+2y+32=0$ 3) $\sqrt{2}x+3y-32=0$ 4) $\sqrt{2}x+3y+32=0$

28. If e and e are the eccentricities of a hyperbola and its conjugate then $1/e^2+1/(e)^2$
1) 2 2)3 3)4 4)1

29. If e and e' are the eccentricities of the hyperbola $x^2/a^2-y^2/b^2=1$ and its conjugate hyperbola, the value of $1/e^2+1/e'^2$ is
1)3 2)2 3)1 4)0

30. If a,b eccentricities of a hyperbola and its conjugate hyperbola then $a^2+b^2=$
1)4 2)1 3) a^2b^2 4) $2a^2b^2$

31. The eccentricity of the hyperbola whose latusrectum is equal to 1/3 of its transverse axis is
1)$2/\sqrt{3}$ 2) $\sqrt{5}/2$ 3) $\sqrt{2}/2$ 4) $\sqrt{3}/2$

32. The angle between the asymptotes of the hyperbola $x^2-3y^2=1$ is
1)$\pi/3$ 2)$\pi/6$ 3)$\pi/2$ 4)$\pi/4$

33. The product of the distances from any point on the hyperbola $x^2/4-y2/1=1$ to its two asymptotes is
1)4/5 2)5/4 3)1/4 4)3/4

34. The curve represented by $x=\sec\theta+\tan\theta$,$y=\sec\theta-\tan\theta$ is
1)a parabola 2)an ellipse 3)a circle 4)a rectangular hyperbola

35. The foci of the ellipse $x^2/16+y^2/b^2=1$ and the hyperbola $x^2/144-y^2/81=1/25$ coincide, then the value of b^2 is
1)1 2)5 3)7 4)9

36. The locus of the middle points of chords of the hyperbola $3x^2-2y^2+4x-6y=0$ parallel to $y=2x$ is
1)$3x-4y=4$ 2)$3y-4x=4$ 3)$3x-4y=2$ 4)$3y-4x=2$

37. The angle between the asymptotes of the hyperbola $x^2-3y^2=3$ is
1)$\pi/3$ 2)$\pi/5$ 3)$\pi6$ 4)$\pi/7$

38. The product of the lengths of the perpendiculars from any point of the hyperbola $x^2-y^2=8$ to its asymptotes is
1)2 2)3 3)4 4)8

39. The curve represented by $x=a(\cosh\theta+\sinh\theta)$,$y=b(\cosh\theta-\sinh\theta)$ is
1) a hyperbola 2)an ellipse 3)a parabola 4)a circle

40. The length of the transverse axis of the hyperbola $4x^2-9y^2+8x+40=0$ is
1)4 2)6 3)$2\sqrt{3}$ 4)$4\sqrt{2}$

41. Match the following.

Hyperbola	Length of the latusrectum
I. $x^2-4y^2=4$	a)1
II. $25y^2-16x^2=400$	b)12
III. $2x^2-y^2-4x-4y-20=0$	c)9/2
IV. $9x^2-16y^2+72x-32y-16=0$	d)25/2

1)a,b,c,d 2)a,d,b,c 3)c,a,b,d 4)b,c,d,a

42. Match the following.

Equations of the curve	Nature of the curve
I. x=2(cost+sin t),y=5(cost-sint)	a)parabola
II. x=3(coshθ +sinhθ),y=(4coshθ-sinhθ)	b)Ellipse
III.$x=\sin^2 t$,y=2cost	c)hyperbola

1)a,b,c 2)b,c,a 3)c,b,a 4)a,c,b

43. A: The angle between the asymptotes $x^2-y^2=2$ is $\pi/2$.
R: The angle between the asymptotes of the hyperbola $x^2/a^2-y^2/b^2=1$ is 2 Tan-1b/a.
1) Both A and R are true and R is the correct explanation of A
2) Both A and R are true but R is not correct explanation of A
3) A is true but R is false 4) A is false but R is true

44. If the eccentricity of a conic is $3/\sqrt{5}$, then the conic is
1)an ellipse 2) a hyperbola 3) a parabola 4) a circle

45. If e and e^1 be the eccentricity of two conics S and S and if $e^2+e^{1\,2}=3$,then both S &S can be
1) ellipse 2) parabolas 3) hyperbolas 4) circles

46. The equation $x^2+3y^2-9x+2y+1=0$ represents
1)an ellipse 2) a parabola 3) a hyperbola 4)circles

47. A normal to the parabola $y^2=4ax$ with slope in touches the rectangular hyperbola $x^2-y^2=a^2$ if
1)$m^6+4m^4-3m^2+1=0$ 2)$m^5-4m^4+3m^2-1=0$
3)$m^6+4m^4+3m^2+1=0$ 4)$m^6-4m^4-3m^2+1=0$

48. The locus of the mid pt of the chords of hyp. $x^2/5-y^2/4=1$ which are parallel to 2x-y+3=0 is
1)8x-5y=1 2) 8x-5y=0 3) 6x-2y+1=0 4) 2x=5y

49. The centre of the hyperbola $9x^2 - 16y^2 - 18x - 32y = 151$ is the point
1)(1,-1) 2)(1,1) 3)(2,3) 4)(-1,1)

50. The equation of the hyperbola whose one focus is (2,2), corresponding directrix is 3x-4y = 1 and whose eccentricity is $\frac{3}{2}$, is

1) $(x-2)^2 + (y-2)^2 = \frac{9}{4}(3x-4y-1)^2$

2) $(x-2)^2 + (y-2)^2 = \frac{9}{100}(3x-4y-1)^2$

3) $(x-2)^2 + (y-2)^2 = \frac{9}{4}(3x-4y-1)^2$

4) $(x+2)^2 + (y+2)^2 = \frac{9}{4}(3x-4y-1)^2$

51. The normal to the hyperbola $4y^2 - 5x^2 = 20$ at $(-4,5)$ is
1) $y - x = 9$ 2) $5y - 4x = 41$ 3) $y + x = 9$ 4) $y + x = 1$

PREVIOUS EAMCET PAPER'S PROBLEMS

52. The curve represented by x=3(cost+sin t),y=4(cost-sint) is [EAMCET 88]
1) Parabola 2) ellipse 3)hyperbola 4)none

53. The foci of the hyperbola $9x^2-16y^2+18x+32y-151=0$ are [EAMCET 89]
1)(2,1),)(-6,2) 2)(-2,5),(-2,-3) 3)(4,1),(-6,1) 4)(-2,4),(-2,-2)

54. The graph represented by the equations $x=\sin^2 t$, y=2cost is [EAMCET 93]
1) a portion of a parabola 2)a parabola3)a part of sine graph 4)a part of hyperbola

55. The product of the distances from any point on the hyperbola $x^2/16-y^2/9=1$ to its two asymptotes is [EAMCET 93]
1)144/25 2)25/144 3)140/25 4)none

56. If e_1,e_2 are the eccentricities of a hyperbola and its conjugate, then
1)$e_1^2+e_2^2=3$ 2)$e_1+e_2=4$ 3)$e_1^2+e_2^2=e_1^2e_2^2$ 4)$e_1=e_2$ [EAMCET 94]

57. The equation of the conic with focus at (1,-1), directrix along x-y+1=0 and eccentricity √2 is
1)$x^2-y^2=1$ 2)xy=1 3)2xy-4x+4y+1=0 4)2xy+4x-4y-1=0 [EAMCET 94]

58. If e and e_1 are the eccentricities of the hyperbola $xy=c^2, x^2-y^2=c^2$ then $e^2+e_1^2$ is equal to
1)1 2)4 3)6 4)8 [EAMCET 95]

59. The number of normals to the hyperbola $x^2/a^2-y^2/b^2=1$ from an external point is

1)2 2)4 3)6 4)5 [EAMCET 95]

60. The vertices of a hyperbola are (2,0),(-2,0)and the foci are (3,0)(-3,0). The equation of the hyperbola is [EAMCET 96]
1) $x^2/5-y^2/4=1$ 2)$x^2/4-y^2/5=1$ 3)$x^2/5-y^2/2=1$ 4)$x^2/2=y^2/5=1$

61. The length of the latusrectum of the hyperbola $x^2-4y^2=4$ is [EAMCET 96]
1)2 2)1 3)4 4)3

62. The eccentricity of the hyperbola $9x^2-16y^2+72x-32y-16=0$ is
1)5/4 2)4/5 3)9/16 4)16/9 [EAMCET 96]

63. The condition that the line y=mx +c may be a tangent to the hyperbola $x^2/a^2-y^2/b^2=1$ is
1)$c^2=a^2m^2-b^2$ 2)$c^2=b^2-a^2m^2$ 3)$c^2=a^2-b^2m^2$ 4)$c^2=a^2+b^2m^2$[EAMCET 96]

64. One of the foci of the hyperbola is origin and the corresponding directrix is 3x+4y+1=0. The eccentricity of the hyperbola is √5. The equation of the hyperbola is [EAMCET 98]
1)$4x^2+11y^2+24xy+6x+8y+1=0$ 2)$8x^2+9y^2+24xy+6x+6y+1=0$
3)$8x^2+9y^2+24xy+6x+8y+1=0$ 4)$8x^2+9y^2-24xy+6x+8y+1=0$

65. The eccentricity of the hyperbola $4x^2-9y^2=2ax+by^2$ is
1)a/b 2) √b/a3) √13/3 4) √13/3 [EAMCET 99]

66. The equation $16x^2+y^2+8xy-74x-78y+212=0$ represents [EAMCET 2001]
1)a circle 2)a parabola 3)an ellipse 4)a hyperbola

67. If the eccentricity of a hyperbola is √3, then the eccentricity of its conjugate hyperbola is: 1) √2 2) √3 3) √(3/2) 4)2√3 (2006)

68. If the line $lx+my=1$ is a normal to the hyperbola $x^2/a^2 + y^2/b^2 =1$ then
$\frac{a^2}{l^2}-\frac{b^2}{m^2}=$
1)$a^2 -b^2$ 2) $a^2 + b^2$ 3) $(a^2 +b^2)^2$ 4) $(a^2 - b^2)^2$ (2007)

69. The distance between the foci of the hyperbola $x^2-3y^2-4x-6y-11=0$ is (2008)
1)4 2)6 3)8 4)10

70. If the circle $x^2 + y^2 = a^2$ intersects the hyperbola $xy = c^2$ in four points (x_i, y_i), for I = 1, 2, 3 and 4, then $y_1 + y_2 + y_3 + y_4 =$ (2009)
1) 0 2) c 3) a 4) c^4

71. The mid-point of the chord 4x–3y=5 of the hyperbola $2x^2–y^3=12$ is: (2009)

1) $\left(0,-\frac{5}{3}\right)$ 2) (2, 1) 3) $\left(\frac{5}{4},0\right)$ 4) $\left(\frac{11}{4},2\right)$

72. The equation of the hyperbola which passes through the point (2,3) and has the asymptotes 4x +3y – 7 = 0 and x – 2y – 1 = 0 is (2010)

1) $4x^2-5xy-6y^2-11x+11y+50=0$
2) $4x^2-5xy-6y^2-11x+11y-43=0$
3) $4x^2-5xy-6y^2-11x+11y+57=0$
4) $x^2-5xy-y^2-11x+11y+43=0$

73. The product of the perpendicular distances from any point on the hyperbola $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ its asymptotes is : (2010)

1) $\frac{a^2b^2}{a^2-b^2}$ 2) $\frac{a^2b^2}{a^2+b^2}$ 3) $\frac{a^2+b^2}{a^2b^2}$ 4) $\frac{a^2-b^2}{a^2b^2}$

74. The angle between the asymptotes of the hyperbola $x^2 - 3y^2 = 3$ is [2011]

1) $\frac{\pi}{6}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{2}$

75. Equation of one of the tangents passing through (2, 8) to the hyperbola $5x^2 - y^2 = 5$ is [2012]

1) 3x + y – 14 = 0 2) 3x – y + 2 = 0 3) x + y + 3 = 0 4) x – y + 6 = 0

76. The area (in square units of the equilateral triangle formed by the tangent at $\left(\sqrt{3},0\right)$ to the hyperbola $x^2 - 3y^2 = 3$ with the pair of asymptotes of the hyperbola is [2012]

1) $\sqrt{2}$ 2) $\sqrt{3}$ 3) $\frac{1}{\sqrt{3}}$ 4) $2\sqrt{3}$

77. If x = 9 is a chord of contact of the hyperbola $x^2 - y^2 = 9$, then the equation of the tangent at one of the points of contact is [2013]

1) $x+\sqrt{3}y+2=0$ 2) $3x-2\sqrt{2}y-3=0$
3) $3x-\sqrt{2}y+6=0$ 4) $x-\sqrt{3}y+2=0$

78. A hyperbola pases through a focus of the ellipse $\frac{x^2}{169}+\frac{y^2}{25}=1$ Its transverse & conjugate axes coincide respectively with the major & axes of the ellipse. The product of eccentricties is 1. Then the equation of the hyperbola is (2014)

1) $\frac{x^2}{169}-\frac{y^2}{25}=1$ 2) $\frac{x^2}{144}-\frac{y^2}{25}=1$ 3) $\frac{x^2}{25}-\frac{y^2}{9}=1$ 4) $\frac{x^2}{144}-\frac{y^2}{9}=1$

79. The product of length of perpendicular from any point on the hyperbola $x^2 - y^2 = 16$ to is symptoes is (2015)
1) 2 2) 4 3) 8 4) 16

80. The foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1$ & the hyperbola $\frac{x^2}{144}+\frac{y^2}{81}=\frac{1}{25}$ coinside, then the value of b^2 is (2015 A.P)
1) 5 2) 7 3) 9 4) 1

81. Let A(2secθ, 3tanθ) & B(2secϕ, 3tanϕ), where θ + ϕ = π / 2, be two points on the hyperbola $x^2 / 4 - y^2 / 9 = 1$. If (α, β) is the point of intersection of normals to the hyperbola at A & B, then β = (2016)
1) -13 / 3 2) 13 / 3 3) 3 / 13 4) -3 / 13

82. The values of m for which the line y = mx + 2 becomes a tangent to the hyperbola $4x^2 - 9y^2 = 36$ is (2016AP)
1) $\pm\frac{2}{3}$ 2) $\pm\frac{2\sqrt{2}}{3}$ 3) $\pm\frac{8}{9}$ 4) $\pm\frac{4\sqrt{2}}{3}$

83. The asymptotes of a hyperbola are parallel to 2x + 3y = 0 & 3x + 2y = 0. The equation of that hyperbola whose centre is at (1, 2) & passing through (5, 3) is (2017AP)
1) (2x + 3y – 8)(3x + 2y – 7) – 154 = 0
2) (2x - 3y – 8)(3x - 2y – 7) – 154 = 0
3) (3x + 2y – 8)(2x + 3y – 7) – 154 = 0
4) (3x - 2y + 8)(2x + 3y – 7) – 154 = 0

KEY

1. 1	2. 2	3. 2	4. 2	5. 3	6. 2	7. 1	8. 3	9. 2	10. 4
11. 3	12. 3	13. 2	14. 3	15. 2	16. 2	17. 2	18. 3	19. 1	20. 1
21. 3	22. 2	23. 3	24. 1	25. 4	26. 2	27. 1	28. 4	29. 3	30. 3
31. 1	32. 1	33. 1	34. 4	35. 3	36. 1	37. 1	38. 3	39. 3	40. 1
41. 2	42. 2	43. 2	44. 3	45. 3	46. 1	47. 3	48. 1	49. 2	50. 2
51. 2	52. 3	53. 2	54. 2	55. 2	56. 1	57. 3	58. 3	59. 2	60. 2
61. 2	62. 1	63. 1	64. 1	65. 4	66. 2	67. 3	68. 3	69. 3	70. 1
71. 2	72. 3	73. 2	74. 3	75. 2	76. 2	77. 2	78. 2	79. 3	80. 2
81. 1	82. 2	83. 1	84.	85.	86.	87.	88.	89.	90.

Exercise-B

1. The point $(at^2, 2bt)$ lies on the hyperbola $x^2/a^2-y^2/b^2=1$ for
1)all values of t 2) $t^2=2+\sqrt{5}$ 3) $t^2=2-\sqrt{3}$ 4) no real value of t

2. The line x cos α+y sin α=p is a tangent to the hyperbola $x^2/a^2-y^2/b^2=1$ if
1) $a^2 \cos^2 \alpha + b^2 \sin^2 \alpha = p^2$ 2) $a^2 \cos^2 \alpha - b^2 \sin^2 \alpha = p^2$

3) $a^2\sin^2 \alpha+b^2\cos^2\alpha=p^2$ 4) $a^2 \sin^2 \alpha-b^2\cos^2\alpha = p^2$

3. If e and e^1 be the eccent. of two conics S and S and if $e^2+e^{1\ 2}=3$,then both S &S can be
1) ellipse 2) parabolas 3) hyperbolas 4) circles

4. The equation $x^2+3y^2-9x+2y+1=0$ represents
1)an ellipse 2) a parabola 3) a hyperbola 4)circles

5. A normal to the parabola $y^2=4ax$ with slope in touches the rectangular hyperbola $x^2- y^2=a^2$ if
1)$m^6+4m^4-3m^2+1=0$ 2)$m^5-4m^4+3m^2-1=0$
3)$m^6+4m^4+3m^2+1=0$ 4)$m^6-4m^4-3m^2+1=0$

6. The locus of the mid pt of the chords of hyp. $x^2/5-y^2/4=1$ which are parallel to $2x-y+3=0$ is
1)$8x-5y=1$ 2) $8x-5y=0$ 3) $6x-2y+1=0$ 4) $2x=5y$

7. The equation of the normal to the hyperbola $x^2-3y^2 =144$ at the positive end of the latus rectum (first quadrant) is
1) $\sqrt{3}x+2y-32=0$ 2) $\sqrt{3}x+2y+32=0$ 3) $\sqrt{2}x+3y-32=0$ 4) $\sqrt{2}x+3y+32=0$

8. If e and e are the eccentricities of a hyperbola and its conjugate then $1/e^2+1/(e)^2$
1) 2 2)3 3)4 4)1

9. The curve represented by $x=a(\cosh\theta +\sinh\theta),y=b(\cosh\theta-\sinh\theta)$ is
1) a hyperbola 2)an ellipse 3)a parabola 4)a circle

10. Match the following.

Equations of the curve	Nature of the curve
I. $x=2(\cos t+\sin t),y=5(\cos t-\sin t)$	a)parabola
II. $x=3(\cosh\theta +\sinh\theta),y=(4\cosh\theta-\sinh\theta)$	b)Ellipse
III.$x=\sin^2 t,y=2\cos t$	c)hyperbola

1)a,b,c 2)b,c,a 3)c,b,a 4)a,c,b

KEY

1. 2	2. 2	3. 3	4. 1	5. 3	6. 4	7. 1	8. 4	9. 1	10. 2

AIEEE PROBLEMS

1. The foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1$ and the hyperbola $\frac{x^2}{144}-\frac{y^2}{81}=\frac{1}{25}$ coincide, then the value of b^2 is [AIEEE 2003]
   1) 1 2) 5 3) 7 4) 9

2. For the hyperbola $\frac{x^2}{\cos^2\alpha}-\frac{y^2}{\sin^2\alpha}=1$, which of the following remains constant when α varies? [AIEEE 2007]
   1) Eccentricity 2) Directrix 3) Abscissa of vertices 4) Abscissa of foci

KEY

1. 3 2. 4

16. INTEGRALS

1. $\int o\, dx = constant$

2. $\int 1\, dx = x + c$

3. $\int x^n\, dx = x^{n+1} / n+1 + c$

4. $\int \sqrt{x}\, dx = 2/3\, x^{3/2} + c$

5. $\int \sqrt{ax+b}\, dx = \frac{2}{3} \frac{(ax+b)^{\frac{3}{2}}}{a} + c$

6. $\int a^x = \frac{a^x}{\log a} + c$

7. $\int \sin x dx = -\cos x + c$

8. $\int \cos x dx = \sin x + c$

9. $\int \tan x dx = \log \sec x + c$

10. $\int \cot x dx = \log \sin x + c$

11. $\int \sec x dx = \log(\sec x + \tan x) + c = \log \tan\left(\frac{\pi}{4} + \frac{x}{2}\right) + c$

12. $\int \operatorname{cosec} x dx = \log(\operatorname{cosec} x - \cot x) + c = \log(\tan \frac{x}{2}) + c$

13. $\int \sinh x dx = \cosh x + c$

14. $\int \cosh x\, dx = \sinh x + c$

15. $\int \tanh x dx = \log \cosh x + c$

16. $\int \coth x dx = \log \sinh x + c$

17. $\int \operatorname{sech} x dx = 2 \tan^{-1} e^x + c$

18. $\int \operatorname{cosech} x dx = 2 \cot h^{-1} e^x + c$

19. $\int \sec^2 x\, dx = \tan x + c$

20. $\int \operatorname{sech}^2 x dx = \tanh x + c$

21. $\int \sec x \tan x dx = \sec x + c$

22. $\int \text{sech}x \tan x \, dx = \sec x + c$

23. $\int \text{sech}x \tanh x \, dx = -\text{sech}x + c$

24. $\int \text{cosec}^2 x dx = -\cot x + c$

25. $\int \text{cosec}x \cot x dx = -\text{cosec}x + c$

26. $\int \text{cosech}x \coth x dx = -\text{cosech}x + c$

27. $\int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1} x + c$

28. $\int \frac{1}{\sqrt{x^2-1}} dx = \cosh^{-1} x + c$

29. $\int \frac{1}{1+x^2} dx = \tan^{-1} x + c$

30. $\int \frac{1}{\sqrt{1+x^2}} dx = \sinh^{-1} x + c$

31. $\int \frac{1}{\sqrt{a^2-x^2}} dx = \sin^{-1} \frac{x}{a} + c$

32. $\int \frac{1}{\sqrt{a^2+x^2}} dx = \sinh^{-1} \frac{x}{a} + c$

33. $\int \frac{1}{\sqrt{x^2-a^2}} dx = \cosh^{-1} \frac{x}{a} + c$

34. $\int \frac{1}{a^2+x^2} dx = \frac{1}{a} \tan^{-1} \frac{x}{a} + c$

35. $\int \frac{1}{a^2-x^2} dx = \frac{1}{2a} \log\left(\frac{a+x}{a-x}\right) + c$

36. $\int \frac{1}{x^2-a^2} dx = \frac{1}{2a} \log\left(\frac{x-a}{x+a}\right) + c$

37. $\frac{1}{x\sqrt{x^2-1}}dx = \sec^{-1} x + c$

38. $\frac{-1}{x\sqrt{x^2-1}}dx = \operatorname{cosec}^{-1} x + c$

39. $\int \sqrt{a^2-x^2}\,dx = \frac{x}{2}\sqrt{a^2-x^2} + \frac{a^2}{2}\sin^{-1}\frac{x}{a} + c$

40. $\int \sqrt{a^2+x^2}\,dx = \frac{x}{2}\sqrt{a^2+x^2} + \frac{a^2}{2}\sinh^{-1}\frac{x}{a} + c$

41. $\int \sqrt{x^2-a^2}\,dx = \frac{x}{2}\sqrt{x^2-a^2} - \frac{a^2}{2}\cosh^{-1}\frac{x}{a} + c$

42. $\int \sin^{-1} x dx = x\sin^{-1} x + \sqrt{1-x^2} + c$

43. $\int \cos^{-1} x dx = x\cos^{-1} x - \sqrt{1-x^2} + c$

44. $\int \tan^{-1} x dx = x\tan^{-1} x - \frac{1}{2}\log\left(1+x^2\right) + c$

45. $\int e^{f(x)} . f'(x)\, dx = e^{f(x)} + c$

46. $\int (f^n(x) . f'(x))\, dx = \frac{f^{n+1}(x)}{n+1} + c$

47. $\int f'(x)/f(x)\, dx = \log f(x) + c$

48. $\int \frac{f'(x)}{\sqrt{f(x)}}\, dx = 2\sqrt{f(x)} + c$

49. $\int e^x[f(x) + f'(x)]\, dx = e^x f(x) + c$

50. $\int f(x) + x.f'(x)\, dx = x f(x) + c$

51. $\int f(x)g(x)dx = f(x)\int g(x)dx - \int[f'(x)\int g(x)]dx + c$

Exercise-A

1. $\int e^x x^3 dx =$

   1) $e^x(x^3-3x^2+6x-6)+c$ 2) $e^x(x^3-6)+c$

   3) $e^x(x^3-3x^2+6x)+c$ 4) $e^x(3x^2+6x-6)+c$

2. $\int e^x x^4 dx =$

   1) $e^x(x^4-4x^3)+c$ 2) $e^x(x^4-4x^3+12x^2-24x+24)+c$

   3) $e^x(x^4-4x^3+12x^2)$ 4) $e^x(12x^2-24x+24)+c$

3. $\int e^x x\, dx =$

   1) e^x 2) xe^x 3) $e^x(x-1)+c$ 4) $2e^x$

4. $\int e^{x^2} x^5 dx$

   1) $e^{x^2}/2\,(x^4-2x^2+2)+c$ 2) $e^x/2\,(x^4-2x^2+2)+c$ 3) $e^x(x^4+2)+c$ 4) e^x

5. $\int e^{\sqrt{x}} dx$

   1) $e^{\sqrt{x}}$ 2) $2\,e^{\sqrt{x}}$ 3) $2\,e^{\sqrt{x}}(\sqrt{x}-1)+c$ 4) $e^{\sqrt{x}}/2$

6. $\int e^{-x} x^2 dx$

   1) $-e^{-x} x^2$ 2) $-e^{-x}(x^2+2x)+c$ 3) $e^{-x} x^2$ 4) $-e^{-x}(x^2+2x+2)+c$

7. $\int e^{-x} x^3 dx$

   1) $e^{-x} x^3$ 2) $-e^{-x}(x^3+3x^2+6x+6)+c$ 3) $e^{-x}(x^3+2x)+c$ 4) $-e^{-x} x^3$

8. $\int e^{2x} x^3 dx$

   1) $e^{2x}(x^3/2)$ 2) $e^{2x}(x^3/2-3x^2/4)$

   3) $e^{2x}(x^3/2-3x^2/4+6x/8-6/16)+c$ 4) $e^{2x}(x^3/2-3x^2/4-4)+c$

9. $\int e^{3x} x^2 dx$

   1) $e^{3x}[x^2/3-2x/9+2/27]+c$ 2) $e^{3x}[x^2/3-2x/9]+c$

   3) $e^{3x}[x^2/3+2/27]+c$ 4) $e^{3x}[2x/9+2/27]+c$

10. $\int e^{-2x} x^5 dx$

    1) $e^{3x}[x^2/3-2x/9+2/27]+c$

    2) $-e^{-2x}[x^5/2+5x^4/4+20x^3/8+60x^2/16+120x/32+120/64]+c$

    3) $e^{2x}[x^5/2+5x^4/4+20x^3/8+60x^2/16]+c$

    4) $e^{2x}[60x^2/16+120x/32+120/64]$

11. $\int a^x x^2 dx$

1)$a^x[x^2/\log a]+c$

2) $a^x[x^2/\log a-2x/(\log a)^2]+c$

3)$a^x[x^2/\log a-2x/(\log a)^2+2/(\log a)^3]+c$

4) $a^x[x^2/\log a+$bvgftr542$x/(\log a)^2]+c$

12. $\int a^x.x^3 dx$

1. $a^x[x^3/\log a-3x^2/(\log a)^2+6x/(\log a)^3-6/(\log a)^4]+c$

2. $a^x[x^3/\log a-3x^2/(\log a)^2+6x/(\log a)^3]+c$

3. $a^x[x^3/\log a-3x^2/(\log a)^2-6/(\log a)^4]+c$

4. $a^x[x^3/\log a+6x/(\log a)^3-6/(\log a)^4]+c$

13. $\int 2^x.x^3 dx$

1)$2^x[x^3/\log 2-3x^2/(\log 2)^2+6x/(\log 2)^3-6/(\log 2)^4]+c$

2)$a^x[x^3/\log 2-3x^2/(\log 2)^2+6x/(\log 2)^3]+c$

3)$a^x[-3x^2/(\log 2)^2+6x/(\log 2)^3]+c$ 4)$a^x[x^3/\log 2-6x/(\log 2)^3]+c$

14. $\int(\log x)^4 dx=$

1)$x[(\log x)^4-4(\log x)^3-24(\log x)+24]+c$

2) $x[(\log x)^4-4(\log x)^3+12(\log x)^2+24]+c$

3) $x[(\log x)^4-4(\log x)^3+12(\log x)^2-24(\log x)]+c$

4) $x[(\log x)^4-4(\log x)^3+12(\log x)^2-24(\log x)+24]+c$

15. $\int(\log x)^3 dx=$___

1)$x[(\log x)^3-3(\log x)^2+6(\log x)-6]+c$

2)$x[(\log x)^3-3(\log x)^2-6(\log x)]+c$

3)$x[(\log x)^3-3(\log x)^2-6]+c$ 4) $x[3(\log x)^2-6(\log x)-6]+c$

16. $\int(\log x)^2 dx=$

1) $x[(\log x)^2-2(\log x)]+c$ 2) $x[(\log x)^2-2(\log x)+2]+c$

3) $x[(\log x)^2+2]+c$ 4) $x[-2(\log x)+2]+c$

17. $\int x\log x\, dx =$

1)$x^2/2(\log x-1/2)+c$ 2) $x/2(\log x-1/2)+c$

3) $x^2/2(\log x)+c$ 4) $x/2(\log x-1)+c$

18. $\int x^2 \log x\, dx=$

1)$x^3/3[\log x-1]+c$ 2) $x^3/3[\log x-1/3]+c$

3) $x/3[\log x-1/3]+c$ 4) $x/3[\log x-1]+c$

Note :1. If a>b, $\int \frac{1}{a+b\cos x}dx = \frac{2}{\sqrt{a^2-b^2}}\tan^{-1}\left(\frac{a-b}{a+b}\right)\tan\frac{x}{2}+c$

2. If a<b $\int \frac{1}{a+b\cos x}dx = \frac{1}{\sqrt{b^2-a^2}}\log\frac{\sqrt{b+a}+\sqrt{b-a}\tan\frac{x}{2}}{\sqrt{b+a}-\sqrt{b-a}\tan\frac{x}{2}}+c$

19. ∫dx/(4+5cosx) =_____
1)1/3log|(3+tanx/2)/(3-tanx/2)|+c 2) 1/3log|(3+tanx/2)|+c
3) 1/3log|(3+tanx/2)/(3-tanx/2)|+c 4)1

20. ∫dx/(5+4cosx) =_____
1)2/3tan^{-1}(1/3)+c 2)2/3tan^{-1}(1/3tanx/2)+c
3)tan^{-1}(tanx/2)+c 4)1/3tan^{-1}(tanx)+c

Note :

If a>b ∫ dx/a+bsinx = $\frac{2}{\sqrt{a^2-b^2}}\tan^{-1}\left(\frac{b+a\tan\frac{x}{2}}{\sqrt{a^2-b^2}}\right)+c$

If a<b ∫ dx = $\frac{1}{\sqrt{b^2-a^2}}\log\left|\frac{a\tan\frac{x}{2}+b-\sqrt{b^2-a^2}}{a\tan\frac{x}{2}+b+\sqrt{b^2-a^2}}\right|+C$

21. ∫ dx/(5+4sinx)= ____
1)2/3tan^{-1}[(4+5tanx/2)]+c 2) $\frac{2\tan^{-1}[(4+5\tan x/2)]}{3}$+c
3) tan^{-1}[(4+5tanx/2)/3]+c 4) 1/3tan^{-1}[(4+5tanx/2)/3]+c

22. ∫dx/(4+5sinx)= _____
1)1/3log|(2tanx/2+1)/(2tanx/2+4)|+c 2) 1/3log|(2tanx/2+1)|+c
3) 1/3log|(2tanx/2+4)|+c 4) 2/3log|(2tanx/2+1)/(2tanx/2+4)|+c
Note:
∫ $\frac{a\cos x + b\sin x\ dx}{c\cos x + d\sin x} = \frac{ac+bd}{c^2+d^2}x + \frac{ad-bc}{c^2+d^2}\log|c\cos x+d\sin x|$

23. ∫(3cosx+2sinx)/(4cosx+3sinx) dx=_____
1)18x/25+1/25log|4cosx+3sinx|+c 2) 18x/25+1/25log|4cosx|+c
3) 18x/25+1/25log|3sinx|+c 4) 18x/25+log|4cosx+3sinx|+c

24. ∫ (3cosx-2sinx) / (4sinx+ 5cosx) dx= _____
1)22/41log|5cosx+4sinx|+c 2) 7x/41+22/41log|5cosx+4sinx|+c
3) 7x/41+log|5cosx+4sinx|+c 4) 7x/41+22/41log|5cosx|+c

25. ∫ 1/(1+tanx) dx=___

1)x/2+log|cosx+sinx|+c 2) 1/2log|cosx+sinx|+c
3) x/2+1/2log|cosx+sinx|+c 4) x/2+1/2log|cosx|+c
Note :

$$\int f^{n}(x)\, f'(x)\, dx = \frac{f^{n+1}(x)}{n+1} + c$$

26. $\int \sin^{10}x \cos x dx$=___
1)sinx/11+c 2)$\sin^{11}$x/11+c 3)sinx/12+c 4)$\cos^{11}$x/11+c

27. $\int \tan^{3} \sec^{2}x\, dx$=___
1)$\tan^{4}$x/4+c 2)$\tan^{5}$x/5+c 3)$\sec^{4}$x/4+c 4)$\cos^{4}$x/4+c

28. $\int \sin^{10}x/(\cos^{12}x)dx$=____
1)tanx+c 2)$\sin^{11}$x/11+c 3)$\cos^{11}$x/11+c 4)$\tan^{11}$x/11+c

29. $\int \sqrt{\tan x}\, .\sec^{2}x dx$=___
1)2/3tanx+c 2)2/3$\tan^{2/3}$x+c 3)2/3$\tan^{3/2}$x+c 4)2/3cotx+c

30. $\int \sin x \cos^{3} x dx$=___
1)2/3$\sin^{3/2}$x+c 2)2/3$\sin^{2/3}$x-2/7$\sin^{7/2}$x+c
3) 2/7$\sin^{7/2}$x+c 4) 2/7$\sin^{7/2}$x+2/3sinx+c

31. $\int \sec^{7}x\, .\tan x dx$=___
1)$\sec^{7}$x/7+c 2)$\sec^{6}$x/6+c 3)sec7x+c 4)sec6x+c

32. $\int \sec x/ (\sec x+\tan x)^{10} dx$=-____
1)-1/[10$(\sec x+\tan x)^{10}$]+c 2) -1/[10$(\sec x)^{10}$]+c
3) -1/[10$(\tan x)^{10}$]+c 4) -1/[10$(\sec x+\tan x)^{10}$]+c

Note: $\int f'(x) / f(x)\, dx = \log |f(x)| + c$

33. $\int \cos x/(a+b\sin x)\, dx$=____
1)1/blog(a+bsinx)+c 2)1/blog(sinx)+c
3)1/blog(cosx)+c 4)1/blog(a+bcosx)+c

34. $\int \sec^{2}x / (a+b\tan x)\, dx$ =_____
1)1/blog(a+bsinx)+c 2)1/blog(sinx)+c
3)1/blog(cosx)+c 4)1/blog(a+btanx)+c

35. $\int \sec x /(a\cos x+b\sin x)\, dx$=____
1)1/blog(a+bsinx)+c 2)1/blog(sinx)+c
3)1/blog(a+btanx)+c 4)1/blog(a+bcosx)+c

36. $\int 1/(\sec x + \tan x)\ dx =$____

1)1/blog(1+sinx)+c 2)1/blog(sinx)+c

3)1/blog(cosx)+c 4)1/blog(1+cosx)+c

37. $\int \sec x \operatorname{cosec} x /(\log(\tan x))\ dx =$___

1)logtanx+c 2)log(log tanx)+c 3)log(cotx) 4)log(log cotx)+c

38. $\int e^{\tan x} . \sec^2 x\ dx =$___

1) $e^{\tan x}$+c 2) $e^{\cot x}$+c 3) $e^{\tan x}$+2tanx+c 4)2tanx+c

39. $\int e^{\sin^2 x} . \sin 2x\ dx =$____

1)sinx+c 2) $e^{\sin^2 x}$+c 3)$e^{\sin x}$+c 4)$e^{\cos x}$+c

40. $\int \sin^{-1}(2x\sqrt{1-x^2})\ dx =$____

1)$2[x\sin^{-1}x+\sqrt{(1-x^2)}]+c$ 2) $\sqrt{(1-x^2)}+c$

3)$2x\sin x+\sqrt{(1-x^2)}+c$ 4)2xsinx+c

41. $\int \sin^{-1}(3x-4x^3)\ dx =$___

1) $3[x\sin^{-1}x+\sqrt{1-x^2}]+c$ 2) $3[\sqrt{(1-x^2)}]+c$

3) $2[x\sin^{-1}x]+c$ 4) $2[x\sin^{-1}x+\sqrt{(1-x^2)}]+c$

42. $\int \cos^{-1}(1-2x^2)\ dx =$____

1) $2[x\sin^{-1}x]+c$ 2) $2[x\sin^{-1}x+\sqrt{(1-x^2)}]+c$ 3) $4[x\sin^{-1}x+\sqrt{(1-x^2)}]+c$

43. $\int \tan^{-1}\left(\frac{x}{\sqrt{1-x^2}}\right)dx =$_____

1) $2[x\sin^{-1}x+\sqrt{(1-x^2)}]+c$ **2) $[x\sin^{-1}x+\sqrt{(1-x^2)}]+c$**

3) $[x\sin^{-1}x+\sqrt{(1-x^2)}]+c$ 4) $2[x\sin^{-1}x]+c$

Note : $\int \tan^{-1} x\ dx = x\tan^{-1}x + 1/2 \log(1+x^2)$

44. $\int \sin^{-1}[(1-x^2)/(1+x^2)]+\sec^{-1}(1+x^2/1-x^2)]\ dx$

1) $\frac{\Pi}{2}x$+c 2)πx+c 3)2πx+c 4)x+c

Note : $\int 1/x(x^n-1)\ dx = 1/n \log|(x^n-1)/x^n|+c$

45. $\int 1/x(x^8-1)\ dx =$

1)1/8logx+c 2)$1/8\log|(x^8-1)/x^8|+c$

3) $1/8\log|(x^8-1)|+c$ 4) $1/8\log|(x^8+1)/x^8|+c$

46. $\int 1/(x^3-x)\,dx=$____

1)$1/2\log x^2+c$ 2)$1/2\log|(x^2-1)|+c$ 3) $1/2\log|(x^2-1)/x^2|+c$ 4) $1/4\log|(x^2+1)|+c$

Note: $\int 1/x(1-x^n)\,dx= 1/n \log|x^n/1-x^n|+c$

47. $\int \tan x/(1-\cos^5 x)\,dx$

1)$-1/5\log|\cos^5 x/(1-\cos^5 x)|+c$ 2) $1/5\log|\cos^5 x/(1-\cos^5 x)|+c$

3) $-1/5\log|\cos^5 x/(1+\cos^5 x)|+c$ 4) $1/5\log|\cos^5 x/(1-\cos^5 x)|+c$

Note: $\int 1/x(x^n+1)\,dx = 1/n \log|x^n/(x^n+1)|+c$

48. $\int 1/(x^4+x)\,dx$ = ____

1)$1/3\log x^3+c$ 2) $1/3\log|x^3/(x^3+1)|+c$

3) $1/3\log|x^3/(x^3-1)|+c$ 4) $\log|x^3/(x^3+1)|+c$

49. $\int \cot x/(\sin^8 x-1)\,dx=$____

1) $\frac{1}{8}\log|(\sin^8 x-1)/\sin^8 x|+c$ 2) $\log|(\sin^8 x-1)/\sin^8 x|+c$

3) $\frac{1}{8}\log|(\sin^8 x+1)/\sin^8 x|+c$ 4) $8\log|(\sin^8 x+1)/\sin^8 x|+c$

50. $\int (x^2+1)/(x^4+1)\,dx=$_____

1) $\frac{1}{\sqrt{2}}\tan^{-1}\left(\frac{x^2-1}{\sqrt{2x}}\right)+c$ 2) $\tan^{-1}[(x-1/x)/\sqrt{2}]+c$

3) $1/\sqrt{2}\tan^{-1}[(x+1/x)/\sqrt{2}]+c$ 4) $\sqrt{2}\tan^{-1}[(x-1/x)/\sqrt{2}]+c$

51. $\int (x^2-1)/(x^4+1)\,dx =$_____

1)$1/2\sqrt{2}\log|(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})|+c$

2) $1/\sqrt{2}\log|(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})|+c$

3)$1/2\log|(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})|+c$

4) $\log|(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})|+c$

52. $\int 1/(x^4+1)\,dx =$_____

1)$1/2[1/\sqrt{2}\tan^{-1}[(x-1/x)/\sqrt{2}]-1/2\sqrt{2}\log[(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})]+c$

2) $1/2[1/\sqrt{2}\tan^{-1}[(x-1/x)/\sqrt{2}]$ 3)$1/2\sqrt{2}\log[(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})]$

4)$[1/\sqrt{2}\tan^{-1}[(x-1/x)/\sqrt{2}]-1/2\sqrt{2}\log[(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})]$

53. $\int x^4/(x^4+1)\,dx =$_____

1)$x-1/2[1/\sqrt{2}\tan^{-1}[(x-1/x)/\sqrt{2}]-1/2\sqrt{2}\log[(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})]+c$

2)$x-1/2[1/\sqrt{2}\tan^{-1}[(x-1/x)/\sqrt{2}]$

3)$x-1/2\sqrt{2}\log[(x+1/x\sqrt{2})/(x+1/x+\sqrt{2})]$

4)$x-[1/\sqrt{2}\tan^{-1}[(x-1/x)/\sqrt{2}]-1/2\sqrt{2}\log[(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})]$

54. $\int x^2/(x^4+1)\,dx =$_____

1)$(1/2\sqrt{2}\tan^{-1}[(x-1/x)/\sqrt{2}]+1/2\sqrt{2}\log|(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})|+c$

2) $\tan^{-1}[(x-1/x)/\sqrt{2}]+1/\sqrt{2}\log|(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})|+c$

3)$1/\sqrt{2}\tan^{-1}[(x+1/x)/\sqrt{2}]+1/2\log|(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})|+c$

4) $\sqrt{2}\tan^{-1}[(x-1/x)/\sqrt{2}]+\log|(x+1/x-\sqrt{2})/(x+1/x+\sqrt{2})|+c$

55. $\int(\sqrt{\tan x}+\sqrt{\cot x})dx=$_____

1) $\sqrt{2}\tan^{-1}[(\tan x-1)/\sqrt{(2\tan x)}]+c$ 2) $\sqrt{2}\tan^{-1}[(\tan x-1)]+c$

3) $\sqrt{2}\tan^{-1}[(\sqrt{(2\tan x)}]+c$ 4) $\tan^{-1}[(\tan x-1)/\sqrt{(2\tan x)}]+c$

Note: $1/(a^2\sin^2 x+b^2\cos^2 x) = (1/ab)\tan^{-1}(a/b\tan x)+c$

56. $\int 1/(4\sin^2 x+9\cos^2 x)dx =$___

1)/1/6 2)$1/6\tan^{-1}(2/3\tan x)+c$ 3)$1/2\tan^{-1}(2/3\tan x)$ 4)$1/6\tan x$

Note:$\int e^{ax}\sin bx\,dx = \frac{e^{ax}}{a^2+b^2}(a\sin bx-b\cos bx)$

$\int e^{ax}\cos bx\,dx = \frac{e^{ax}}{a^2+b^2}(a\cos bx+b\sin bx)$

57. $\int e^x\sin x\,dx =$____

1)$e^x/2(\sin x-\cos x)+c$ 2)$e^x(\sin x-\cos x)$ 3)$\sin x-\cos x$ 4)e^x

58. $\int e^{-x}\cos x\,dx=$____

1)$e^{-x}/2(-\cos x+\sin x)+c$ 2)$e^{-x}/2\cos 2x$

3)$e^{-x}\cos x+c$ 4)$e^{-x}(\cos x-\sin x)$

59. $\int e^x\sin^2 x\,dx=$____

1)$e^x/2$ 2)$e^x/2-e^x/10$

3)$e^x/2-e^x/10(\cos 2x+2\sin 2x)+c$ 4)$\sin 2x\cos 2x$

60. $\int 1/(1+\sin^2 x)\,dx=$____

1)$1/\sqrt{2}\tan^{-1}(\sqrt{2}\tan x)+c$ 2) $1/\sqrt{2}\tan^{-1}(\tan x)+c$

3) $1/2\tan^{-1}(\sqrt{2}\tan x)+c$ 4) $1/\sqrt{2}\tan^{-1}(\sqrt{2}\tan 2x)+c$

61. $\int 1/(4+5\sin^2 x)\,dx=$____

1)$1/3\tan^{-1}(3/2\tan x)+c$ 2) $1/6\tan^{-1}(3/2\tan x)+c$

3) $1/6\tan^{-1}(1/2\tan x)+c$ 4) $1/6\tan^{-1}(3\tan x)+c$

62. $\int 1/(3+\cos 2x)\,dx =$_____

1)$1/2\sqrt{2}\tan^{-1}(1/\sqrt{2}\tan x)+c$ 2) $1/\sqrt{2}\tan^{-1}(1/\sqrt{2}\tan x)+c$

3) $1/2\tan^{-1}(1/\sqrt{2}\tan x)+c$ 4) $1/2\sqrt{2}\tan^{-1}(\sqrt{2}\tan x)+c$

Note: $$\frac{1}{\sqrt{a^2+b^2}}\log\left|\tan\left(\frac{x+\tan^{-1}\frac{b}{a}}{2}\right)\right|+c$$

63. $\int 1/(\sin x+\cos x)\,dx=$____

1)$1/\sqrt{2}\log|\tan x|$ 2)$1/\sqrt{2}\log|\tan[(x+\pi/4)/2]|+c$ 3)$1/2\log\tan x$ 4)$1/2$

64. $\int 1/(\sin x+\sqrt{3}\cos x)\,dx =$____

1)$1/2\log|\tan[(x+\pi/3)/2]|+c$ 2) $1/2\log|\tan[(x+\pi/3)|+c$

3) $\log|\tan[(x+\pi/3)/2]|+c$ 4) $1/2\log|\tan[(x/2)]|+c$

Note: $\int[f(x) + x\,f'(x)]\,dx = x\,f(x) + c$

65. $\int [\sin x^2+2x^2\cos x^2]dx =$

1)$x\sin x+c$ 2)$x\sin^2 x+c$ 3)$x\sin x^2+c$ 4)$\sin x+c$

66. $\int \frac{x+\sin x}{1+\cos x}\,dx =$

1)$x\tan(x/2)+c$ 2)$\tan x/2+c$ 3)$x\tan x+c$ 4)$x+c$

67. $\int \frac{\log x-1}{(\log x)^2}\,dx =$

1)$x/y+c$ 2)$x/\log x+c$ 3)$\log x+c$ 4)$\log x/x+c$

Note: Integrals of the forms $\int \sin^m x.\cos^n x\,dx$

1.If one power in even and another is odd then put t= function with even power.

2. If both powers are odd then put t= function with highest power

3. If one power is a fraction then put t= function with fractional power.

68. $\int \sin x.\cos^2 x\,dx=$____

1)$\cos x$ 2)$-\cos^3 x/3+c$ 3)$\cos^3 x+c$ 4)$\cos 4x+c$

69. $\int \sin^3 x\cos^5 x\,dx=$____

1)$\cos^6 x/6$ 2)$\cos^8 x/8$ 3)$-\cos^6 x/6+\cos^8 x/8+c$ 4)$\cos x/4$

70. $\int \sin^2 x.\cos^2 x\,dx=$____

1)$1/8[x-(\sin 4x/4)]+c$ 2)$1/8x\sin 4x$ 3)$\sin 4x/4$ 4)$\sin 4x$

71. $\int \sin^{1/3} x.\cos^3 x\,dx =$___

1) $3/4\sin^{4/3}x+c$ 2) $3/10\sin^{10/3}x+c$

3) $3/4\sin^{4/3}x+3/10\sin^{10/3}x+c$ 4) $3/4\sin^{4/3}x-3/10\sin^{10/3}x+c$

72. $\int 1/(x^2+x+1)\,dx=$_____

1) $2/\sqrt{3}\tan^{-1}[(2x+1)/\sqrt{3}]+c$ 2) $2/3\tan^{-1}(2x+1)$

3) $2/\sqrt{3}\tan(2x+1)$ 4) $2/\sqrt{3}\tan^{-1}(2x+1)$

73. $\int 1/\sqrt{x^2+x+1}\,dx=$_____

1) $\sinh^{-1}[(2x+1)/\sqrt{3}]+c$ 2) $\sinh^{-1}\sqrt{x}$ 3) $(2x+1)/\sqrt{3}$ 4) $1/\sqrt{x+1}$

74. $\int 1/(x^2+5x-6)\,dx=$_____

1) $1/7\log(x-1)+c$ 2) $1/7\log|(x-1)/(x+6)|+c$ 3) $1/7\log(x+6)+c$ 4) $1/7$

75. $\int 1/(\sqrt{x^2+5x-6})\,dx=$____

1) $\cosh^{-1}[(2x+5)/7]+c$ 2) $\cosh^{-1}(2x+5)+c$

3) $\sin^{-1}[(2x+5)/7]+c$ 4) $\cosh^{-1}[(2x)/7]+c$

76. $\dfrac{8x+5}{\sqrt{4x^2+5x+4}}\,dx =$

1) $2\sqrt{4x^2+5x+4}+c$ 2) $\log\sqrt{4x^2+5x+4}+c$

3) $\sqrt{4x^2+5x+4}$ 4) $\log(4x^2+5x+4)+c$

77. $\int (4x+3)/(2x^2+4x+3)\,dx=$____

1) $\log(2x^2+4x+3)$ 2) $\log(2x^2+4x+3)+1/2(2x^2+4x+3)$

3) $\log(2x^2+4x+3)-(1/2\sqrt{2})\tan^{-1}\sqrt{2}(x+1)+c$ 4) $(1/2\sqrt{2})\tan^{-1}\sqrt{2}(x+1)+c$

Note: $\int \dfrac{f'(x)}{\sqrt{f(x)}}\,dx=2\sqrt{f(x)}+c$

78. $\int \dfrac{2x+5}{\sqrt{x^2+2x+3}}\,dx =$_____

1) $\sqrt{x^2+2x+3}$ 2) $\sqrt{x^2+2x+5}$

3) $2\sqrt{(x^2+2x+3)}$ 4) $2\sqrt{(x^2+2x+3)}+3\sinh^{-1}[(x+1)/\sqrt{2}]$

Note : Integrals of the form $\int ax+b/\sqrt{px+q}\,dx$, $\int\sqrt{px+q}/ax+b\,dx$,

$\int(ax+b)\sqrt{px+q}\,dx$ put $t^2=\sqrt{px+q}$

79. $\int (x+2)\sqrt{x+1}$

1) $\tan^{-1}\sqrt{x+1}+c$ 2) $2\tan^{-1}\sqrt{x+1}+c$ 3) $\tan^{-1}x+c$ 4) $\tan x$

80. $\int (x+3)\sqrt{3x+4}\,dx =$

1)2/9[$(3x+4)^{5/2}/5 + 5(3x+4)^{3/2}/3]+c$ 2) 2/9 $(3x+4)^{5/2}/5+c$
3) $5(3x+4)^{3/2}/3 +c$ 4)2/9+c

Note:

Integrals of the form $\int \sqrt{(x-\alpha)/(x-\beta)}dx$
multiply the Nr and Dr by $(x-\alpha)$

81. $\int \sqrt{\frac{1+x}{1-x}}dx =$

1)$\sin^{-1}x$ 2)$\sin^{-1}x-\sqrt{1-x^2}+c$ 3) $\sqrt{1-x^2}$ 4)$\cos^{-1}x$

82. I: $\int \frac{1-x^4}{1-x}dx = x+\frac{x^2}{2}+\frac{x^3}{3}+\frac{x^4}{4}+c$

II: $\int \left[1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+.....\right]dx = e^x + c$

1)only I is true 2)only II is true **3)both I and II are true** 4) neither I nor II true

83. I: $\int \frac{1}{1+\cos 2x}dx = \left(\frac{1}{2}\right)\tan x + c$

II: : $\int \frac{1+\sin^2 x}{1+\cos 2x}dx = \tan x - \frac{x}{2} + c$

1)only I is true 2)only II is true
3)both I and II are true 4) neither I nor II true

84. If $\int \frac{x^4}{x^2+1}dx = = Ax^3+Bx+C\ \mathrm{Tan}^{-1}x+c$ then the descending order of A,B,C is

1)A,B,C 2)B,C,A 3)C,A,B 4)C,B,A

85. If $\int \cos^4 x\, dx = Ax+B\sin 2x+C\sin 4x+c$ then the ascending order of A,B,C is

1)A,B,C 2)B,C,A 3)C,A,B 4)C,B,A

86. I. $\int \sec^2 x\, \mathrm{cosec}^2 x dx=$ a)x+c
II. . $\int \tan^2 x \cot^2 x\, dx=$ b)tanx-x+c
III. . $\int \sin^2 x \sec^2 x\, dx=$ c)-cotx-x+c
IV. . $\int \cos^2 x\, \mathrm{cosec}^2 x dx=$ d)tanx-cotx+c

1)a,b,c,d 2)b,c,a,d 3)d,a,b,c 4)b,d,c,a

PREVIOUS EAMCET PAPERS PROBLEMS

87. $\int x^5/(x^2+1)dx=$ [1998]

1)$x^4/4+x^2/2+\tan^{-1}x+c$ 2)$x^4/4-x^2/2+1/2\log(x^2+1)+c$
3)$x^4/4+x^2/2-\tan^{-1}x+c$ 4)$x^4/4-x^2/2+1/2\log(x+1)+c$

88. $\int dx/ x(1+\log x)^3 =$ [1999]

1)$-1/[2(1+\log x)^2]+c$ 2)$1/[2(1+\log x)^2]+c$ 3)$1/(1+\log x)+c$ 4)$1+\log x$

89. $\int (1/x)\sqrt{(x-1)/(x+1)}\,dx =$ [1999]

1)$\cosh^{-1}x-\sec^{-1}x+c$ 2)$\cosh^{-1}x+\sec^{-1}x+c$

3)$\sinh^{-1}x-\sec^{-1}x+c$ 4)$\sinh^{-1}x-\mathrm{cosec}^{-1}x+c$

90. $\int 3/(2x^2-x-1)dx=$ [1999]

1)$\log|(x-1)/(x+1)|+c$ 2)$\log|(x+1)/(2x+1)|+c$

3)$\log|(x-1)/(2x+1)|+c$ 4)$\log|(x-1)/(2x+1)|+c$

91. $\int (\sin^3x+\cos^3x)/(\sin^2x\cos^2x)dx =$ [1999]

1)$\sin x-\cos x+c$ 2)$\tan x+\cot x+c$ 3)$\sec x-\mathrm{cosec}x+c$ 4)$\sin x-\cos x+c$

92. $\int e^x (1-\cot x+\cot^2x)\,dx=$ [2000]

1)$e^x \cot x+c$ 2)$-e^x (\cot x)+c$ 3)$e^x \mathrm{cosec}x+c$ 4)$-e^x \mathrm{cosec}x+c$

93. $\int \sin^6 x/(\cos^8x)\,dx=$ [2000]

1)$\tan 7x+c$ 2)$(\tan^7x)/7+c$ 3)$(\tan 7x)/7+c$ 4)$\sec^7x+c$

94. $\int (x+1)^2e^x\,dx=$ [2001]

1)xe^x+c 2)x^2e^x+c 3)$(x+1)e^x+c$ 4)$(x^2+1)e^x+c$

95. $\int dx/a^2\sin^2x+b^2\cos^2x=$ [2001]

1)$(1/ab)\tan^{-1}[(a\tan x)/b]+c$ 2)$\tan^{-1}[(a\tan x)/b]+c$

3) $(1/ab)\tan^{-1}[(a\tan x)]+c$ 4) $(1/ab)\tan^{-1}[(\tan x)/b]+c$

96. $\int dx/\sqrt{x(x+9)}=$ [2001]

1)$2/3\tan^{-1}\sqrt{x}+c$ 2)$2/3\tan\text{-}^{1}(\sqrt{x}/3)+c$ 3)$\tan^{-1}(\sqrt{x}/3)+c$ 4)$\tan^{-1}\sqrt{x}/395$

97. $\int dx/(7+5\cos x)=$ [2002]

1)$1/\sqrt{3}\tan^{-1}[(1/\sqrt{3})\tan(x/2)]+c$ 2) $1/\sqrt{6}\tan^{-1}[(1/\sqrt{6})\tan(x/2)]+c$

3) $1/7\tan^{-1}[\tan(x/2)]+c$ 4) $1/4\tan^{-1}[\tan(x/2)]+c$

98. $\int[3^x/\sqrt{(9^x-1)}]dx=$ [2002]

1)$(1/\log 3).\log|3^x+\sqrt{(9^x-1)}|+c$ 2) $(1/\log 3).\log|3^x-\sqrt{(9^x-1)}|+c$

3) $(1/\log 9).\log|3^x+\sqrt{(9^x-1)}|+c$ 4) $(1/\log 3).\log|9^x+\sqrt{(9^x-1)}|+c$

99 . $\int[(1+x+\sqrt{(x+x^2)})/(\sqrt{x}+\sqrt{(1+x)})]dx=$ [2003]

1)$1/2\sqrt{(1+x)}+c$ 2)$2/3\sqrt{(1+x)^3}+c$ 3) $\sqrt{(1+x)}+c$ 4)$2\sqrt{(1+x)^3}+c$

100. $\int(1+x-x^{-1})e^{x+1/x}\,dx=$ [2003]

1)$(x+1)e^{x+1/x}+c$ 2)$(x-1)e^{x+1/x}+c$ 3)$-xe^{x+1/x}+c$ 4)$xe^{x+1/x}+c$]

101. $\int dx/[(x+100)\sqrt{x+99}]= f(x)+c$ $f(x)=$ [2004]

1)2(x+100)1/2 2)3(x+100)1/2

3)2Tan-√(x+99) 4)2Tan-(√x+100)

102. $\int\sqrt{(\cot x)}/(\sin x\cos x)dx= -f(x)+c$ $f(x)=$ [2004]

1)$2\sqrt{\tan x}$ 2)$-2\sqrt{\tan x}$ 3) $-2\sqrt{\cot x}$ 4)$2\sqrt{\cot x}$

103. $\int \frac{\sin x}{\cos x\,(1+\cos x)}\,dx = f(x)+c \Rightarrow f(x)=$ (2005)

1)$\log\left|\frac{1+\cos x}{\cos x}\right|$ 2) $\log\left|\frac{\cos x}{1+\cos x}\right|$ 3)$\log\left|\frac{\sin x}{1+\sin x}\right|$ 4)$\log\left|\frac{+\sin x}{\sin x}\right|$

104. $\int \frac{x^{49}\tan^{-1}(x^{50})}{(1+x^{100})}\,dx = k(\tan^{-1}(x^{50}))^2+c \Rightarrow k=$ (2005)

1)1/50 2)-1/50 3)1/100 4)-1/100

105. $\int \sin\text{-}1\,[2x/(1+x^2)]dx=f(x)-\log(1+x^2)+c \Rightarrow f(x)=$ (2005)

1)$2x\tan^{-1}x$ 2)$-2x\tan^{-1}x$ 3)$x\tan^{-1}x$ 4)$-x\tan^{-1}x$

106. $\int \frac{x}{\sqrt{a^3-x^3}}\,dx= g(x)+c \Rightarrow g(x) =$ (2006)

1)$\frac{2}{3}\cos^{-1}x$ 2)$\frac{2}{3}\sin^{-1}x$ 3) $\frac{2}{a}\sin^{-1}x$ 4) $\frac{2}{a}\cos^{-1}(x)$

107. $\int \frac{dx}{x^2+2x+2} =f(x) +c \Rightarrow f(x) =$ (2006)

1)$\tan^{-1}(x+1)$ 2) $2\tan^{-1}(x+1)$ 3)$-\tan^{-1}(x+1)$ 4) $3\tan^{-1}(x+1)$

108. Observe the following statements: (2006)

A : $\int \left(\frac{x^2-1}{x^2}\right) e^{(x2+1)/x} +c$

B : $\int f'(x)\,e^{f(x)}dx = f(x) +c$

Then which of the following is true?

1) Both A and R are true and R is not the correct reason for A
2) Both A and R are true and R is the correct reason for A
3) A is true, R is false 4)A is false, R is true

109. If $\int \frac{e^x-1}{(e^x+1)}dx =$ [2007]

1)$2\log(e^x+1)$ 2) $2\log(\log\cosh x)+c$

3)log(logsinh x)+c 4)log(log(e^x+e^{-x})+c)

110. $\int \frac{\sin x + 8\cos x}{4\sin x + 6\cos x} dx =$ [2007]

1)x + $\frac{1}{2}$ log(4 sin x + 6 cos x)+C 2) 2x + log(2sin x + 3cos x)+C

3) x +2log(2sin x +3cos x)+C 4) log(4 sin x + 6 cos x)+C

111. $\int \text{Tan}^{-1}\left(\frac{\sqrt{1-x}}{1+x}\right) dx =$ [2007]

1) $\frac{1}{2}$ ($\cos^{-1}$ x - $\sqrt{1-x^2}$)+C 2) $\frac{1}{2}$ (x$\cos^{-1}$ x + $\sqrt{1-x^2}$)+C

3) $\frac{1}{2}$ (x$\cos^{-1}$ x - $\sqrt{1-x^2}$)+C 4) $\frac{1}{2}$ (x$\sin^{-1}$ x + $\sqrt{1-x^2}$)+C

112. If $e^x\left(\int \frac{1-\sin x}{1-\cos x}\right)dx = f(x) + c$ then f(x)= (2008)

1) $e^x \cot\left(\frac{x}{2}\right)$ 2) $e^{-x} \cot\left(\frac{x}{2}\right)$ 3)- $e^x \cot\left(\frac{x}{2}\right)$ 4)- $e^{-x} \cot\left(\frac{x}{2}\right)$

113. If $I_n = \int x^n e^{cx} dx$ for n ≥ 1, then $c.I_n + n.I_{n-1} =$ (2008)

1)$x^n e^{cx}$ 2)x^n 3) e^{cx} 4) $x^n + e^{cx}$

114. If $\int e^x (1+x)\sec^2(xe^x)dx = f(x) + c$ then f(x)= (2008)

1)cos(xe^x) 2)sin(xe^x) 3)2$\tan^{-1}$(x) 4)tan(xe^x)

115. $\int \frac{dx}{(x+1)\sqrt{4x+3}} =$ (2009)

1) $\tan^{-1} \sqrt{4x+3} + c$ 2) $3\tan^{-1} \sqrt{4x+3} + c$

3) $2\tan^{-1} \sqrt{4x+3} + c$ 4) $4\tan^{-1} \sqrt{4x+3} + c$

116. $\int \left(\frac{2-\sin 2x}{1-\cos 2x}\right) e^x dx =$ (2009)

1) e^x cot x + c 2) e^x cot x – c 3) 2e^x cot x + c 4) –2e^x cot x + c

117. If $I_n = \int \sin^n x dx$, then $nI_n - (n-1) I_{n-2} =$ (2009)

1) $\sin^{n-1}$ x cos x 2) $\cos^{n-1}$ x sin x 3) –$\sin^{n-1}$ x cos x 4) –$\cos^{n-1}$ x sin x

118. $\int \frac{7x^8+8x^7}{(1+x+x^8)^2}dx = f(x)+c \Rightarrow f(x) =$ (2010)

1) $\frac{x^8}{1+x+x^8}$ 2) $28\log(1 + x + x^8)$

3) $\frac{1}{1+x+x^8}$ 4) $\frac{-1}{1+x+x^8}$

119. If $f_n(x) = \log\log\log.....\log x\,(\log\, is\, repeated\, n-times)$, then $\int (xf_1(x)f_2(x).....f_n(x))^{-1}dx =$ (2010)

1) $f_{n+1}(x)+c$ 2) $\frac{f_{n+1}(x)}{n+1}+c$ 3) $nf_n(x)+c$ 4) $\frac{f_n(x)}{n}+c$

120. $\int (1-\cos x)\cos ec^2 x dx = f(x)+c \Rightarrow f(x) =$ (2010)

1) $\tan\frac{x}{2}$ 2) $\cot\frac{x}{2}$ 3) $2\tan\frac{x}{2}$ 4) $\frac{1}{2}\tan\frac{x}{2}$

121. $\int\left(\sqrt{\frac{a+x}{a-x}}+\sqrt{\frac{a-x}{a+x}}\right)dx =$ [2011]

1) $2\sin^{-1}\left(\frac{x}{a}\right)+c$ 2) $2a\sin^{-1}\left(\frac{x}{a}\right)+c$ 3) $2\cos^{-1}\left(\frac{x}{a}\right)+c$ 4) $2a\cos^{-1}\left(\frac{x}{a}\right)+c$

122. If $\int \frac{\sin^8 x-\cos^8 x}{1-2\sin^2 x\cos^2 x}dx = A\sin 2x + B$, then A = [2011]

1) $\frac{-1}{2}$ 2) -1 3) $\frac{1}{2}$ 4) 1

123. $\int \frac{1+\cos 4x}{\cot x-\tan x}dx =$ [2011]

1) $-\frac{1}{4}\cos 4x+c$ 2) $\frac{1}{8}\cos 4x+c$ 3) $\frac{1}{4}\sin 4x+c$ 4) $-\frac{1}{8}\cos 4x+c$

124. $\int \sec^2 x\cos ec^4 x dx = -\frac{1}{3}\cot^3 x + k\tan x - 2\cot x + c \Rightarrow k =$ [2012]

1) 4 2) 3 3) 2 4) 1

125. $\int \frac{dx}{\sqrt{x-x^2}} =$ [2012]

1) $-2\,sin^{-1}\sqrt{1-x}+c$ 2) $2\sin^{-1}x+c$

3) $2x\sin^{-1}x+c$ 4) $\sin^{-1}\sqrt{x}+c$

126. $\int e^x\left(\frac{2+\sin 2x}{1+\cos 2x}\right)dx =$ [2013]

1) $e^x \cot x + c$ 2) $2e^x \sec^2 x + c$ 3) $e^x \cos 2x + c$ 4) $e^x \tan x + c$

127. $\int \frac{x - \sin x}{1 + \cos x} dx = x \tan\left(\frac{x}{2}\right) + p \log\left|\sec\left(\frac{x}{2}\right)\right| + c \Rightarrow p =$ [2013]

1) -4 2) 4 3) 2 4) -2

128. $\int \frac{dx}{x(\log x - 2)(\log x - 3)} = I + c \Rightarrow I =$ [2013]

1) $\frac{1}{x} \log\left|\frac{\log x - 3}{\log x - 2}\right|$ 2) $\log\left|\frac{\log x - 3}{\log x - 2}\right|$ 3) $\log\left|\frac{\log x - 2}{\log x - 3}\right|$ 4) $\log\left|(\log - 3)(\log x - 2)\right|$

129. If $\int \frac{dx}{(1+\sqrt{x})\sqrt{x - x^2}} = \frac{A\sqrt{x}}{\sqrt{1-x}} + \frac{B}{\sqrt{1-x}} + C,$ where is a real constant then A + B = (2014)

1) 0 2) 1 3) 2 4) 3

130. For any integer $n \geq 2$ let $I_n = \int tan^n x dx$ If $I_n = \frac{1}{a} tan^{n-1} x - bI_{n-2}$ for $n \geq 2,$ then the ordered pair (a, b) = (2014)

1) $\left(n - 1 \frac{n-2}{n-1}\right)$ 2) (n, 1) 3) (n – 1, 1) 4) $\left(n - 1 \frac{n-1}{n-2}\right)$

131. If $\int \frac{(x^2 - 1)}{(x+1)^2 \sqrt{x(x^2 + x + 1)}} dx = A tan^{-1}\left(\sqrt{\frac{x^2 + x + 1}{x}}\right) + c,$ in which c is a constant then A = (2014)

1) 3 2) 2 3) 1 4) $\frac{1}{2}$

132. If $\int \frac{x+5}{x^2 + 4x + 5} dx = a \, log\left(x^2 + 4x + 5\right) + b \, tan^{-1}(x + k) + cons \, tan \, t$ then (1, b, k) = (2015)

1) $\left(\frac{1}{2}, 3, 2\right)$ 2) $\left(\frac{1}{2}, 1, 2\right)$ 3) $\left(\frac{1}{2}, 3, 1\right)$ 4) (1, 3, 2)

133. $\int \sqrt{e^x - 4} dx =$ (2015)

1) $tan^{-1}\left(\frac{\sqrt{e^x - 1}}{2}\right) + \sqrt{e^x - 4} + c$ 2) $2\sqrt{e^x - 4} - 4 tan^{-1}\left(\frac{\sqrt{e^x - 4}}{2}\right) + c$

3) $2\sqrt{e^x - 4} - 4 cot^{-1}\left(\frac{\sqrt{e^x - 4}}{2}\right) + c$ 4) $2\sqrt{e^x - 4} - 4 tan^{-1}\left(\sqrt{e^x - 4}\right) + c$

134. $\int e^{-x} tan^{-1}\left(e^{x}\right)dx = f\left(x\right)-\frac{1}{2}log\left(1+e^{2x}\right)+c \Rightarrow f\left(x\right)=$ (2015)

1) $e^{x}-e^{-x} tan^{-1}\left(e^{x}\right)$ 2) $x^{2}+e^{-x} tan^{-1}\left(e^{x}\right)$

3) $-e^{-x} tan^{-1}\left(e^{x}\right)$ 4) $x-e^{-x} tan^{-1}\left(e^{x}\right)$

135. $\int \sqrt{\frac{2+x}{2-x}}dx =$ (2015)

1) $2 sin^{-1}\left(\frac{x}{2}\right)+\sqrt{4-x^{2}}+c$ 2) $cos^{-1}\left(\frac{x}{2}\right)-\sqrt{4-x^{2}}+c$

3) $sin^{-1}\left(\frac{x}{2}\right)-\sqrt{4-x^{2}}+c$ 4) $2 sin^{-1}\left(\frac{x}{2}\right)-\sqrt{4-x^{2}}+c$

136. $\int \frac{dx}{\left(x-1\right)\sqrt{x^{2}-1}} =$ (2015 A.P)

1) $-\sqrt{\frac{x-1}{x+1}}+c$ 2) $\sqrt{\frac{x-1}{x^{2}+1}}+c$ 3) $-\sqrt{\frac{x+1}{x-1}}+c$ 4) $\sqrt{\frac{x^{2}+1}{x-1}}+c$

137. $\int e^{x} \frac{x^{2}+1}{\left(x+1\right)^{2}} dx =$ (2015 A.P)

1) $\frac{e^{x}}{x+1}+c$ 2) $\frac{-e^{x}}{x-1}+c$ 3) $e^{x}\left(\frac{x-1}{x+1}\right)+c$ 4) $e^{x}\frac{\left(x+1\right)}{x+1}+c$

138. $\int \frac{x+1}{x\left(1+xe^{x}\right)} dx =$ (2015 A.P)

1) $log\left|\frac{1+xe^{x}}{xe^{x}}\right|+c$ 2) $log\left|\frac{xe^{x}}{1+xe^{x}}\right|+c$

3) $e^{x}\left(\frac{x-1}{x+1}\right)+c$ 4) $e^{x}\left(\frac{x+1}{x-1}\right)+c$

139. $\int \frac{f\left(x\right)g'\left(x\right)-f'\left(x\right)g\left(x\right)}{f\left(x\right)g\left(x\right)}\left[log\left(g\left(x\right)\right)-log\left(f\left(x\right)\right)\right]dx =$ (2015 A.P)

1) $log\left(\frac{g\left(x\right)}{f\left(x\right)}\right)+c$ 2) $\frac{1}{2}\left[log\left(\frac{g\left(x\right)}{f\left(x\right)}\right)\right]^{2}+c$

3) $\frac{g\left(x\right)}{f\left(x\right)}log\left(\frac{g\left(x\right)}{f\left(x\right)}\right)+c$ 4) $log\left[\frac{g\left(x\right)}{f\left(x\right)}\right]-\frac{g\left(x\right)}{f\left(x\right)}+c$

140. $\int \frac{\left(x^{2}+1\right)}{x^{4}+7x^{2}+1}dx =$ (2016)

1) $\frac{1}{3}\tan^{-1}\left(\frac{x^2-1}{3x}\right)+c$ 2) $\tan^{-1}\left(\frac{x^2-1}{x}\right)+c$

3) $\frac{1}{3}\tan^{-1}\left(\frac{x^2-1}{x}\right)+c$ 4) $\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{x^2-1}{\sqrt{3}x}\right)+c$

141. $\int \frac{x^2}{\sqrt{1+x^2}}dx =$ (2016)

1) $\sqrt{1+x^2}-\frac{x}{3}\left(1+x^2\right)^{1/2}+c$ 2) $x\sqrt{1+x^2}+\frac{2}{3}\left(1+x^2\right)^{1/2}+c$

3) $x^2\sqrt{1+x^2}-\frac{2}{3}\left(1+x^2\right)^{3/2}+c$ 4) $x^2\sqrt{1+x^2}-\frac{1}{3}\left(1+x^2\right)^{1/2}+c$

142. $\int \frac{dx}{\cos(x+4)\cos(x+2)} =$ (2016)

1) $\frac{1}{\sin x}\log\left|\cos(x+4)^2\right|+c$ 2) $\frac{1}{2}\log\left|\frac{\sec(x+2)}{\sec(x+4)}\right|+c$

3) $\frac{1}{\sin 2}\log\left|\frac{\sec(x+4)}{\sec(x+2)}\right|+c$ 4) $\log\left|\frac{\sec(x+4)}{\sec(x+2)}\right|+c$

143. $\int \frac{2x+2}{\sqrt{x^2-4x-5}}dx =$ (2016)

1) $\sqrt{x^2-4x-5}+\log\left|x+\sqrt{x^2-4x-5}\right|+c$

2) $\log\left|\sqrt{x^2-4x-5}\right|+\sqrt{x^2-4x-5}+c$

3) $\sqrt{x^2-4x-5}+6\log x\left|(x-2)+\sqrt{x^2-4x-5}\right|+c$

4) $2\sqrt{x^2-4x-5}+6\log x\left|(x+2)+\sqrt{x^2-4x-5}\right|+c$

144. If $\int x^3e^{5x}dx = \frac{e^{5x}}{5^4}\left(f(x)\right)+c$, then f(x) = (2016AP)

1) $\frac{x^2}{5}-\frac{3x^2}{5^2}+\frac{6x}{5^3}-\frac{6}{5^4}$ 2) $5x^3 - 5^2x^2 + 5^2x - 6$

3) $5^2x^3 - 15x^2 + 30x - 6$ 4) $5^3x^3 - 75x^2 + 30x - 6$

145. $\int \frac{x}{\left(x^2+2x+2\right)^2}dx =$ (2016AP)

1) $\frac{x^2+2}{x^2+2x+2}-\frac{1}{2}\tan^{-1}(x+1)+c$ 2) $\frac{x^2+2}{2(x^2+2x+2)}-\frac{1}{2}\tan^{-1}(x-1)+c$

3) $\frac{x^2-2}{4(x^2+2x+2)}-\frac{1}{2}\tan^{-1}(x+1)+c$ 4) $\frac{2(x-1)}{(x^2+2x+2)}+\frac{1}{2}\tan^{-1}(x+1)+c$

146. If $\int \log(a^2+x^2)\,dx = h(x)+c$, then h(x) = (2016AP)

1) $x\log(a^2+x^2)+2\tan^{-1}\left(\frac{x}{a}\right)$ 2) $x^2\log(a^2+x^2)+x+a\tan^{-1}\left(\frac{x}{a}\right)$

3) $x\log(a^2+x^2)-2x+2a\tan^{-1}\left(\frac{x}{a}\right)$ 4) $x^2\log(a^2+x^2)+2x-a^2\tan^{-1}\left(\frac{x}{a}\right)$

147. For x > 0, if $\int(\log x)^5\,dx =$

$x\left[A(\log x)^5+B(\log x)^4+C(\log x)^3+D(\log)^2+E(\log x)+F\right]+cons\tan t,$ then

A + B + C + D + E + F =

(2016AP)

1) -44 2) -42 3) -40 4) -36

148. $\int \frac{dx}{x(x^4+1)} =$ (2017)

1) $\frac{1}{4}\log\left(\frac{x^4+1}{x^4}\right)+C$ 2) $\frac{1}{4}\log\left(\frac{x^4}{x^4+1}\right)+C$

3) $\frac{1}{4}\log(x^4+1)+C$ 4) $\frac{1}{4}\log\left(\frac{x^4}{x^4+2}\right)+C$

149. $\sin^{-1}\frac{\sqrt{3}}{2}+\sin^{-1}\sqrt{\frac{2}{3}} =$

(2017)

1) $\sin^{-1}\frac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}}$ 2) $\pi-\sin^{-1}\frac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}}$

3) $-\pi-\sin^{-1}\frac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}}$ 4) $\pi+\sin^{-1}\frac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}}$

150. $\int x^4e^{2x}dx =$ (2017)

1) $\frac{e^{2x}}{4}(2x^4-4x^3+6x^2-6x+3)+C$ 2) $\frac{e^{2x}}{2}(2x^4-4x^3+6x^2-6x+3)+C$

3) $\frac{e^{2x}}{8}\left(2x^4+4x^3+6x^2+6x+3\right)+C$ 4) $\frac{e^{2x}}{4}\left(2x^4+4x^3+6x^2+6x+3\right)+C$

151. $\int\left(\sqrt{\tan x}+\sqrt{\cot x}\right)dx=$ (2017AP)

1) $\sqrt{2}Tan^{-1}\left(\frac{\tan x+1}{\sqrt{\tan x}}\right)+c$ 2) $\sqrt{2}Tan^{-1}\left(\frac{\tan x-1}{\sqrt{2\tan x}}\right)+c$

3) $\frac{1}{\sqrt{2}}Tan^{-1}\left(\frac{\tan x+1}{\sqrt{2}\tan x}\right)+c$ 4) $\frac{1}{\sqrt{2}}Tan^{-1}\left(\frac{\sqrt{\tan x}-1}{\sqrt{2}\tan x}\right)+c$

152. $\int\frac{3\sin x-5\cos x}{7\cos x+2\sin x}dx=$ (2017AP)

1) $-\frac{29}{53}x-\frac{31}{53}\log\left|7\cos x+2\sin x\right|+c$ 2) $\frac{11}{51}x+\frac{41}{51}\log\left|7\cos x+2\sin x\right|+c$

3) $\frac{29}{53}x+\frac{31}{53}\log\left|3\sin x-5\sin x\right|+c$ 4) $\frac{29}{51}x-\frac{41}{51}\log\left|7\cos x+2\sin x\right|+c$

153. $\int\frac{1-x^7}{x(1+x)^7}dx=aIn\left|x\right|+bIn\left|x^7+1\right|+c\Rightarrow(a,b)=$ (2017AP)

1) $\left(1,\frac{2}{7}\right)$ 2) $\left(1,\frac{-7}{2}\right)$ 3) $\left(1,\frac{-2}{7}\right)$ 4) $\left(2,\frac{-2}{7}\right)$

154. $\int\frac{6x^2-17x-5}{(x-3)(x-2)^2}dx=$ (2017AP)

1) $\log\frac{(x-2)^2}{(x-3)^4}+\frac{3}{x-2}+c$ 2) $\log\left[(x-2)^4(x-3)^2\right]+\frac{3}{x-2}+c$

3) $\log\frac{(x-2)^8}{(x-3)^2}-\frac{15}{x-2}+c$ 4) $\log(x+3)-\frac{1}{x-2}+c$

155. If $\int f(x)\cos x dx=\frac{1}{2}\left(f(x)\right)^2+C$ & f(0) = 0, then $f'(0)=$ (2017)

1) 1 2) -1 3) 0 4) 2

156. If $\int e^{2x}f'(x)dx=g(x)$, then $\int\left(e^{2x}f(x)+e^{2x}f'(x)\right)dx=$ (2017)

1) $\frac{1}{2}\left[e^{2x}f(x)-g(x)\right]+C$ 2) $\frac{1}{2}\left[e^{2x}f(x)+g(x)\right]+C$

3) $\frac{1}{2}\left[e^{2x}f(2x)+g(x)\right]+C$ 4) $\frac{1}{2}\left[e^{2x}f'(x)+g(x)\right]+C$

157. Match the following

List – I	List – II
I. $\int_{-1}^{1} x\lvert x\rvert dx$	a) $\frac{\pi}{2}$
II. $\int_{0}^{\frac{\pi}{2}}\left(1+\log\left(\frac{4+3\sin x}{4+3\cos x}\right)\right)dx$	b) $\int_{0}^{\frac{a}{2}} f(x)dx$
III. $\int_{0}^{a} f(x)dx$	c) $\int_{0}^{a}\left[f(x)+f(-x)\right]dx$
IV. $\int_{-a}^{a} f(x)dx$	d) 0
	e) $\int_{0}^{a} f(a-x)dx$

	I	II	III	IV		I	II	III	IV	
1)	d	a	e	c	2)	d	a	c	b	
3)	d	c	a	e	4)	a	d	b	c	

158. If $\int f(x)\cos x dx=\frac{1}{2}\left(f(x)\right)^2+C$ & f(0) = 0, then $f'(0)=$ (2017)

1) 1 2) -1 3) 0 4) 2

KEY

1) **1**	2) **2**	3) **3**	4) **1**	5) **3**	6) **4**	7) **2**	8) **3**	9) **1**	10) **2**
11) **3**	12) **1**	13) **1**	14) **4**	15) **1**	16) **2**	17) **1**	18) **2**	19) **1**	20) **2**
21) **2**	22) **1**	23) **1**	24) **2**	25) **3**	26) **2**	27) **1**	28) **4**	29) **3**	30) **2**
31) **1**	32) **1**	33) **4**	34) **3**	35) **3**	36) **2**	37) **1**	38) **2**	39) **1**	40) **1**
41) **2**	42) **2**	43) **1**	44) **2**	45) **3**	46) **1**	47) **2**	48) **1**	49) **2**	50) **1**
51) **1**	52) **1**	53) **1**	54) **1**	55) **1**	56) **2**	57) **1**	58) **1**	59) **3**	60) **1**
61) **2**	62) **1**	63) **2**	64) **1**	65) **3**	66) **1**	67) **2**	68) **2**	69) **3**	70) **1**
71) **4**	72) **1**	73) **1**	74) **2**	75) **1**	76) **1**	77) **3**	78) **4**	79) **2**	80) **1**
81) **2**	82) **3**	83) **3**	84) **3**	85) **4**	86) **3**	87) **2**	88) **1**	89) **1**	90) **3**
91) **3**	92) **2**	93) **2**	94) **4**	95) **1**	96) **2**	97) **2**	98) **1**	99) **2**	100) **4**
101) **3**	102) **4**	103) **1**	104) **3**	105) **1**	106) **4**	107) **1**	108) **3**	109) **3**	110) **1**
111) **1**	112) **3**	113) **1**	114) **4**	115) **3**	116) **1**	117) **3**	118) **1**	119) **1**	120) **1**
121) **2**	122) **1**	123) **4**	124) **4**	125) **1**	126) **4**	127) **1**	128) **2**	129) **1**	130) **3**
131) **2**	132) **1**	133) **2**	134) **4**	135) **4**	136) **3**	137) **3**	138) **2**	139) **2**	**140)3**
141) **3**	142) **3**	143) **2**	144) **1**	145) **3**	146) **3**	147) **1**	148) **2**	149) **2**	**150)1**
151) **2**	152) **1**	153) **3**	154) **3**	155) **1**	156) **2**	157) **1**	158) **1**	159)	

Exercise-B

1. $\int \frac{\sqrt{\tan x}}{\sin x \cos x} dx =$

1) $2\sqrt{\tan x} + c$ 2) $2\sqrt{\cot x} + c$ 3) $\frac{\sqrt{\tan x}}{2} + c$ 4) None of these

2. $\int \frac{\sin x - \cos x}{\sqrt{1 - \sin 2x}} e^{\sin x} \cos x dx =$

1) $e^{\sin x} + c$ 2) $e^{\sin x - \cos x} + c$ 3) $e^{\sin x + \cos x} + c$ 4) $e^{\cos x - \sin x} + c$

3. $\int e^{3\log x} \left(x^4 + 1\right)^{-1} dx =$

1) $\log\left(x^4 + 1\right) + c$ 2) $\frac{1}{4}\log\left(x^4 + 1\right) + c$

3) $-\log\left(x^4 + 1\right)$ 4) None of these

4. $\int e^{x \log a} e^x dx =$

1) $(ae)^x + c$ 2) $\frac{(ae)^x}{\log(ae)} + c$ 3) $\frac{e^x}{1 + \log a} + c$ 4) None of these

5. $\int \frac{xe^x}{(1+x)^2} dx =$

1) $\frac{e^x}{x+1} + c$ 2) $e^x(x+1) + c$ 3) $-\frac{e^x}{(x+1)^2} + c$ 4) $\frac{e^x}{1+x^2} + c$

6. $\int e^{\tan^{-1} x} \left(\frac{1 + x + x^2}{1 + x^2}\right) dx =$

1) $xe^{\tan^{-1} x} + c$ 2) $x^2 e^{\tan^{-1} x} + c$ 3) $\frac{1}{x} e^{\tan^{-1} x} + c$ 4) None of these

7. If $\int \frac{2^x}{\sqrt{1 - 4^x}} dx = k \sin^{-1}\left(2^x\right) + c$, then k=

1) log2 2) $\frac{1}{2}$log2 3) $\frac{1}{2}$ 4) $\frac{1}{\log 2}$

8. If $\int \frac{dx}{1 + \sin x} = \tan\left(\frac{x}{2} + a\right) + b$, then

1) $a=-\frac{\pi}{4}, b\in R$ 2) $a=\frac{\pi}{4}, b\in R$ 3) $a=\frac{5\pi}{4}, b\in R$ 4) None of these

9. $\int(1-\cos x)\operatorname{cosec}^2 x\,dx =$

1) $\tan\frac{x}{2}+c$ 2) $\cot\left(\frac{x}{2}\right)+c$ 3) $\frac{1}{2}\tan\frac{x}{2}+c$ 4) $2\tan\frac{x}{2}+c$

10. The value of the integral $\int\left(e^{a\log x}+e^{x\log a}\right)dx$ is:

1) $\frac{x^a}{a}+\frac{a^x}{\log a}$ 2) $\frac{x^{a+1}}{a+1}+\frac{a^x}{\log a}$ 3) $\frac{x^{a+1}}{\log a}+\frac{a^x}{a+1}$ 4) None of these

11. $\int\frac{x^3-1}{x^3+x}dx =$

1) $x-\log x+\log\left(x^2+1\right)-\tan^{-1}x+c$

2) $x-\log x+\frac{1}{2}\log\left(x^2+1\right)-\tan^{-1}x+c$

3) $x+\log x+\frac{1}{2}\log\left(x^2+1\right)+\tan^{-1}x+c$ 4) None of the above

12. If $\int\frac{xe^x}{\sqrt{1+e^x}}dx=f(x)\sqrt{1+e^x}-2\log g(x)+c,$ then g(x)=

1) x-1 2) $\frac{\sqrt{1+e^x}-1}{\sqrt{1+e^x}+1}$ 3) $\frac{\sqrt{1+e^x}+1}{\sqrt{1+e^x}-1}$ 4) 2(x-2)

13. $\int 5^{5^{5^x}}.5^{5^x}.5^x dx =$

1) $\frac{5^{5^x}}{(\log 5)^3}+c$ 2) $5^{5^{5^x}}(\log 5)^3+c$ 3) $\frac{5^{5^{5^x}}}{(\log 5)^3}+c$ 4) None of these

14. $\int\frac{dx}{9+16\sin^2 x}=$

1) $\frac{1}{3}\tan^{-1}\left(\frac{3\tan x}{5}\right)$ 2) $\frac{1}{5}\tan^{-1}\left(\frac{\tan x}{15}\right)$

3) $\frac{1}{15}\tan^{-1}\left(\frac{\tan x}{5}\right)$ 4 $\frac{1}{15}\tan^{-1}\left(\frac{5\tan x}{3}\right)$

15. $\int\frac{a^{\sqrt{x}}}{\sqrt{x}}dx =$

1) $2a^{\sqrt{x}}\log_e{}^a$ 2) $2a^{\sqrt{x}}\log_a{}^e$ 3) $2a^{\sqrt{x}}\log_{10}{}^a$ 4) $2a^{\sqrt{x}}\log_a{}^{10}$

16. Integral of $f(x) = \sqrt{1+x^2}$ with respect to x^2 is:

1) $\frac{2}{3}\frac{\left(1+x^2\right)^{3/2}}{x}+c$ 2) $\frac{2}{3}\left(1-x^2\right)^{3/2}+c$

3) $\frac{2}{3}\left(1+x^2\right)^{3/2}+c$ 4) None of these

17. Let $x^2 \neq n\pi - 1, n \in N$, then $\int x\sqrt{\frac{2\sin\left(x^2+1\right)-\sin 2\left(x^2+1\right)}{2\sin\left(x^2+1\right)+\sin 2\left(x^2+1\right)}}dx$ is:

1) $\log\left|\frac{1}{2}\sec\left(x^2+1\right)\right|+c$ 2) $\log\left|\sec\left(\frac{1}{2}\left(x^2+1\right)\right)\right|+c$

3) $\frac{1}{2}\log\left|\sec\left(x^2+1\right)\right|+c$ 4) None of the above

18. $\int\sum_{r=0}^{\infty}\frac{x^r 3^r}{\lfloor r}dx =$

1) $\frac{e^{3x}}{3}+c$ 2) $\frac{e^{2x}}{2}+c$ 3) $\frac{e^{3x}}{3}-c$ 4) $\frac{e^{2x}}{2}-c$

19. $\int\left(\frac{1}{\sqrt{3x+4}-\sqrt{3x-1}}\right)dx =$

1) $\frac{2}{45}\left[\left(3x+4\right)^{3/2}+\left(3x-1\right)^{3/2}\right]+c$ 2) $\frac{2}{45}\left[\left(3x-4\right)^{3/2}+\left(3x+1\right)^{3/2}\right]+c$

3) $\frac{2}{45}\left[\left(x-4\right)^{3/2}+\left(x+1\right)^{3/2}\right]+c$ 4) $\frac{2}{45}\left[\left(x-1\right)^{3/2}+\left(x+3\right)^{3/2}\right]+c$

KEY

1) **1**	2) **1**	3) **2**	4) **2**	5) **1**	6) **1**	7) **4**	8) **1**	9) **1**	10) **2**
11) **2**	12) **2**	13) **3**	14) **4**	15) **2**	16) **3**	17) **2**	18) **1**	19) **1**	20)

AIEEE PROBLEMS

1. If $\int\frac{\sin x}{\sin(x-\alpha)}dx = Ax + B\ \log\sin(x-\alpha) + C$, then value of (A, B) is [2004]

1) (sinα, cosα) 2) (–cosα, sinα) 3) (–sinα, cosα) 4) (cosα, sinα)

[Key: 4]

17. DEFINITE INTEGRALS

1. $\int_0^x [x]dx = x[x] - \left[\frac{x}{2}\right]([x]+1)$

2. $\int_0^{\pi/2} \sin^n x dx = \int_0^{\pi/2} \cos^n x dx = \frac{(n-1)}{n}\frac{(n-3)}{n-2}\frac{(n-5)}{n-4}.....\frac{2}{3}.1$ if n= odd

$\frac{(n-1)}{n}\frac{(n-3)}{n-2}\frac{(n-5)}{n-4}.....\frac{1}{2}.\frac{\pi}{2}$ if n= even

3. $\int_0^{\pi} \frac{dx}{(a^2\cos^2 x + b^2\sin^2 x)} = \frac{\pi}{ab}$

4 . $\int_0^{\pi} \frac{xdx}{(a^2\cos^2 x + b^2\sin^2 x)} = \frac{\pi^2}{(2ab)}$

5. $\int_0^{\pi/2} \frac{xdx}{(a^2\sin^2 x + b^2\cos^2 x)} = \frac{\pi}{(2ab)}$

6. $\int_0^{\pi/2} \frac{xdx}{(a^2\sin^2 x + b^2\cos^2 x)} = 0$

7. $\int_0^{a} \frac{dx}{\left(x + \sqrt{a^2 - x^2}\right)} = \frac{\pi}{4}$

8. $\int_a^{b} \frac{f(x)}{f(x) + f(a+b-x)} = \frac{(b-a)}{2}$

10. $\int_0^{\pi/2} \frac{\sin^n x \text{ or } \cos^n x}{(\sin^n x + \cos^n x)} dx = \frac{\pi}{4}$

11. $\int_0^{\pi/2} \frac{\sec^n x \text{ or } \operatorname{cosec}^n x}{(\sec^n x + \operatorname{cosec}^n x)} dx = \frac{\pi}{4}$

12. $\int_0^{\pi/2} \frac{\tan^n x \text{ or } \cot^n x}{(\tan^n x + \cot^n x)} dx = \frac{\pi}{4}$

13. $\int_0^{\pi/2} \frac{(a\sin^n x + b\cos^n x)}{\left[(\sin^n x + \cos^n x) \text{ or } (1 + \sin^n x \cos^n x)\right]} dx = (a+b)\frac{\pi}{4}$

14. $\int_a^{b} \sqrt{\frac{x-a}{b-x}} dx = \frac{\pi(b-a)}{2}$

15. $\int_a^{b} \sqrt{(x-a)(b-x)} dx = \frac{\pi(b-a)^2}{8}$

16. $\int_a^b \frac{1}{\sqrt{(x-a)(b-x)}}dx = \pi$

17. $\int_0^{\pi/2} \log\sin x dx = \int_0^{\pi/x} \log\cos x dx = -\pi/2\log 2$

18. $\int_0^{\pi/2} \log\tan x dx = \int_0^{\pi/x} \log\cot x dx = 0$

19. $\int_a^b \frac{|x|}{x}dx$ = a+b if a<0<b

= b-a if 0<a<b

= a-b if a<b<0

20. $\int_0^a x(a-x)^n dx = \frac{a^{n+2}}{(n+1)(n+2)}$

21 $\int_0^\infty e^{-ax}\sin bx dx = \frac{b}{(a^2+b^2)}$

22. $\int_0^\infty e^{-ax}\cos bx dx = \frac{a}{(a^2+b^2)}$

23. $\int_0^\infty \sin^m xb\cos^n x dx = \frac{m-1}{m+n}.\frac{m-3}{m+n-2}.....\int_0^{\pi/2}\cos^n x dx$ Multiply the above by $\pi/2$ if m and n both are even.

i) If a<c<b then $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$

ii) $\int_a^b f(x)dx = \int_a^b f(a+b-x)dx$

24. $\int_0^{\pi/2} \sin^m x\cos^n x dx = \frac{m-1}{m+n}\frac{m-3}{m+n-2}----\frac{1}{1+n}$ if m=odd

$\frac{m-1}{m+n}\frac{m-3}{m+n-2}----\frac{1}{2+n}\int_0^{\pi/2}\cos^n x dx$ if m= even.

25 $\int_0^{2a} f(x)dx = 2\int_0^a f(x)dx$ if f(2a –x)

=0 if f(2a-x)=-f(x)

26. $\int_a^b f(x)dx = -\int_b^a f(x)dx.$

27. $\int_a^b f(x)dx = \int_b^a f(a-x)dx.$

28. $\int_{-a}^{a} f(x)dx = 2\int_{0}^{a} f(x)dx$, if $f(x)$ is an even function

$= 0$, if $f(x)$ is an odd function.

29. If $f(x)$ is a periodic function with period a then $\int_{0}^{ma} f(x)dx = n\int_{0}^{a} f(x)dx$

30. $\int_{0}^{\pi/4}\left[\tan^{n} x + \tan^{n-2} x\right]dx = \frac{1}{n-1}$

31. $\int_{\pi/4}^{\pi/2}\left[\cot^{n} x + \cot^{n-2} x\right]dx = \frac{1}{n-1}$

32. If a>b, then $\int_{0}^{\pi/2}\frac{dx}{a+b\cos x} = \frac{2}{\sqrt{a^2-b^2}}Tan^{-1}\sqrt{\frac{a-b}{a+b}}$

33. If a<b then $\int_{0}^{\pi/2}\frac{dx}{a+b\cos x} = \frac{1}{\sqrt{b^2-a^2}}\log\left|\frac{\sqrt{b+a}+\sqrt{b-a}}{\sqrt{b+a}-\sqrt{b-a}}\right|$

34. If $a>b$ then $\int_{0}^{\pi/2}\frac{dx}{a+b\sin x} = \frac{2}{\sqrt{a^2-b^2}}Tan^{-1}\sqrt{\frac{a-b}{a+b}}$

35. If a<b then $\int_{0}^{\pi/2}\frac{dx}{a+b\sin x} = \frac{1}{\sqrt{b^2-a^2}}\log\left|\frac{\sqrt{b+a}+\sqrt{b-a}}{\sqrt{b+a}-\sqrt{b-a}}\right|$

36. $\int_{0}^{n}[x]dx = \frac{n(n-1)}{2} = {}^{n}C_2$

37. $\int_{0}^{\infty}\frac{1}{\left(x+\sqrt{x^2+1}\right)}dx = \frac{n}{n^2-1}$

38. $\int_{0}^{a} xf(x)dx = \frac{a}{2}\int_{0}^{a} f(x)dx = a\int_{0}^{a/2} f(x)dx$ if $f(a-x) = f(x)$

39. Area of the circle $x^2+y^2=r^2$ is πr^2.

40. Area bounded by the circle $x^2+y^2=r^2$ in I quadrant and the line y=mx and x-axis is $\frac{1}{2}r^2\theta$(Area of the sector of a circle).

41. Area bounded by the ellipse $x^2/a^2+y^2/b^2=1$ is πab sq. units.

42. Area bounded between parabola $y^2=4ax$ and $x^2=4by$ is $\frac{16ab}{3}$.

43. Area bounded by the parabola $y^2=4ax$ and its ordinate is 2/3rd of area of rectangle.

44. Area bounded by $x^2=4ay$ and line x=k and x-axis is $\int_{0}^{k} ydx = \int_{0}^{k} x^2/4adx$.

n-1

45. $$\underset{n\to\infty}{Lt}\ 1/n\sum_{r=0}^{n-1} f(r/n)=\int_0^1 f(x)$$

$$\underset{n\to\infty}{Lt}\ 1/n\sum_{r=1}^{n-1} f[(r-1)/n]=\int_0^1 f(x)\,dx$$

46. The area of the region bounded by y^2 =4ax, y=mxis $8a^2/3m^3$ sq. unit.

47. The area of the region bounded by the parabola y =ax^2+bx+c and x-axis is

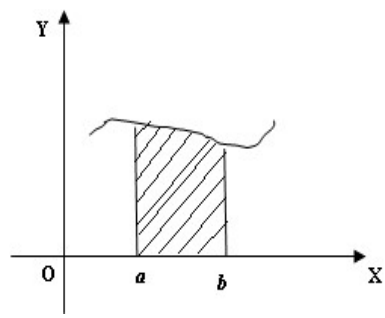
$$\frac{(b^2-4ac)^{\frac{3}{2}}}{6a^2}.$$

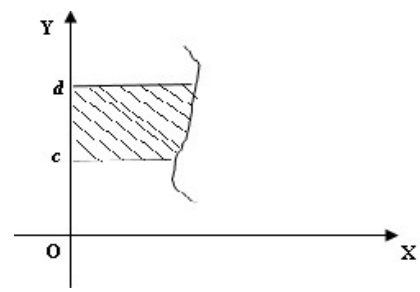
48. The area of the region bounded by the parabola x =ay^2+by+c and y-axis is

$$\frac{(b^2-4ac)^{\frac{3}{2}}}{6a^2}.$$

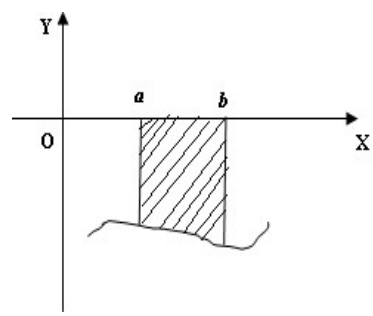
49. **Area of a curve**

(i) If $y = f(x)$ is a curve which is continuous on $[a, b]$ and if $f(x) \geq 0$, for all $x \in [a, b]$, then the area bounded by the curve $y = f(x)$, X – axis and the lines $x = a$, $x = b$ is given by $\int_a^b f(x)dx$



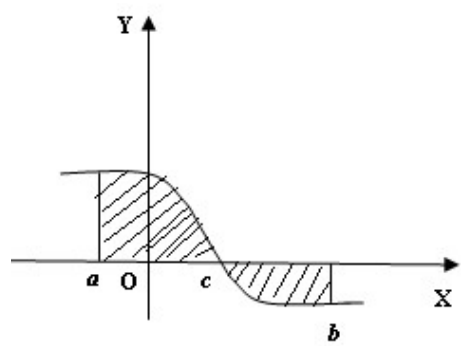


(ii) Let $x = g(y)$ be a curve which is continous on $[c, d]$. Suppose $g(y) \geq 0$ for all $y \in [c, d]$. Then the area bounded by the curve $x = g(y)$, Y –axis and the lines, $y = c$, $y = d$ is $\int_c^d g(y)dy$



(iii) Let $y = f(x)$ be a curve which is continuous $[a, b]$. Suppose $f(x) \leq 0$ for all $x \in [a, b]$. Then the area bounded by the curve $y = f(x)$, X-axis and the lines $x = a$, $x = b$ is

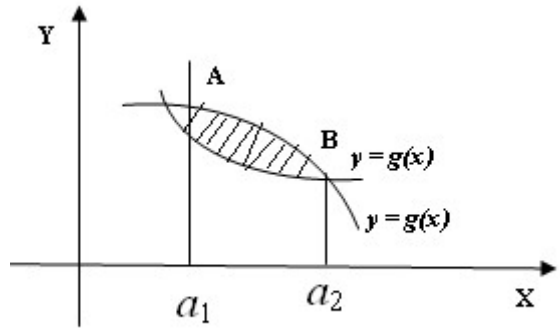
$$-\int_a^b f(x)dx \text{ or } \left|\int_a^b f(x)dx\right|$$



(iv) Let $y = f(x)$ be a curve which is continous on $[a, b]$. Suppose the curve meets X-axis at $x = c$ where $c \in (a, b)$ (that is $f(c) = 0$). Suppose $f(x) \geq 0$ in $[a, c]$ and

$f(x) \le 0$ in $[c, b]$. Then the area bounded by the curve $y = f(x)$, X-axis between the line $x = a$, $x = b$ is $\left|\int_a^c f(x)dx\right| + \left|\int_c^b f(x)dx\right|$

(v) Let $y = f(x)$ and $y = g(x)$ be two curves which are continous on their domains of definition. Suppose the two curves intersect at the points $A(a_1, b_1)$ and $B(a_2, b_2)$ and then the area bounded between the curves between the points A and B is $\left|\int_{a_1}^{a_2} f(x) - g(x)dx\right|$



50. If f is continous in $[a, b]$ and the graph of f is symmetric about the X-axis, then the area boundec by the curves $y = f(x)$, $y = -f(x)$ and the lines $x = a$, $x = b$ $2\int_a^b f(x)dx$

Exercise-A

1. $\int_0^2 [x]\, dx =$

   1)1 2)3 3)4 4)7

2. $\int_0^4 [x]\, dx$=_____

   1)2 2)4 3)6 4)8

3. $\int_0^{\pi/2} \sin^4 x\, dx$=

   1)3π/16 2)2π/16 3)4π/12 4)π/16

4. $\int_0^{\pi/2} \cos^7 x\, dx$=

   1)16 2)35 3)16/35 4)35/16

5. $\int_0^{\pi} \cos^5 (x/2)\, dx$=_____

   1)16/32 2)15/32 3)15/16 4)16/15

6. $\int_0^1 x^6 / \sqrt{1-x^2}\, dx$=___

   1)5π/23 2)5π/32 3)4π/32 4)32/4π

7. $\int_{-a}^{a} x^4 / \sqrt{a^2-x^2}\ dx=$

1)$3\pi a^4/8$ 2) $2\pi/8$ 3) $3\pi/8$ 4)$3\pi a^2/8$

8. $\int_{0}^{\pi/2} 1/(4\sin^2 x+9\cos^2 x)\ dx =$

1) $\pi/3$ 2) $\pi/5$ 3) $\pi/12$ 4) $\pi/6$

9. $\int_{0}^{\pi/2} 1/ (1+ \sin^2 x)\ dx =$_____

1) $\pi/2\sqrt{2}$ 2) $\pi/\sqrt{2}$ 3) $\pi/4\sqrt{2}$ 4) $\pi/2$

10. $\int_{0}^{\pi/2} 1 / (4+ 5 \sin^2 x)\ dx=$_____

1) $\pi/4$ 2) $\pi/8$ 3) $\pi/6$ 4) $\pi/12$

11. $\int_{0}^{1} dx/(x+ \sqrt{1-x^2}) =$

1) $\pi/2$ 2) $\pi/3$ 3) $\pi/4$ 4) $\pi/12$

12. $\int_{0}^{3} dx/ (x+ \sqrt{9-x^2})=$_____

1) $\pi/2$ 2) $\pi/3$ 3) $\pi/6$ 4) $\pi/4$

13. $\int_{2}^{3} \sqrt{x}\ / (\sqrt{x} + \sqrt{5-x}\ )\ dx$

1)1/2 2)2/5 3)3/2 4)2/3

14. $\int_{3}^{5} \sqrt{x}\ / (\sqrt{x} + \sqrt{8-x}\ )\ dx=$_____

1)1 2)2 3)5/3 4)3/5

15. $\int_{3}^{7} \sqrt{10-x}\ dx\ / (\sqrt{10-x}\ + \sqrt{x})$

1)1 2)2 3)7/3 4)3/7

16. $\int_{0}^{2a} f(x) / (f(x) + f(2a-x))\ dx=$_____

1)a 2)2a 3)a^2 4)4a

17. $\int_0^{\pi/2} \sqrt{\tan x} / (\sqrt{\tan x} + \sqrt{\cot x})\, dx =$_____

1) $\pi/2$ 2) $\pi/4$ 3) $\pi/6$ 4) $\pi/8$

18. $\int_0^{\pi/2} \sqrt[3]{\operatorname{cosec} x}\, dx / \sqrt[3]{\sec x} + \sqrt[3]{\operatorname{cosec} x})\, dx =$_____

1) $\pi/2$ 2) $\pi/4$ 3) $\pi/6$ 4) $\pi/8$

19. $\int_0^{\pi/2} \sin x / (\sin x + \cos x)\, dx =$____

1) $\pi/2$ 2) $\pi/4$ 3) $\pi/6$ 4) $\pi/8$

20. $\int_0^{\pi/2} 1 / (1+\tan x)\, dx =$

1) $\pi/2$ 2) $\pi/4$ 3) $\pi/6$ 4) $\pi/8$

21. $\int_0^{\pi/2} (3\sin x + 5 \cos x) / (\sin x + \cos x)\, dx =$____

1) 2π 2) $\pi/2$ 3) $\pi/4$ 4) 4π

22. $\int_0^{\pi/2} (\sin x - \cos x) / (\sin x + \cos x)\, dx =$____

1) 1 2) π 3) 2π 4) 0

23. $\int_2^5 \sqrt{5-x / x-2}\, dx =$____

1) $\pi/2$ 2) 2π 3) $3\pi/2$ 4) 4π

24. $\int_2^3 \sqrt{x-3 / 2-x}\, dx =$_____

1) $\pi/2$ 2) $\pi/12$ 3) $\pi/4$ 4) $\pi/6$

25. $\int_0^1 \sqrt{x/(1-x)}\, dx =$

1) $\pi/4$ 2) $\pi/6$ 3) $\pi/2$ 4) 2π

26. $\int_2^5 \sqrt{(x-2)(5-x)}\, dx =$ _____

1) 9π 2) 8π 3) $9\pi/8$ 4) $8\pi/9$

27. $\int_2^3 \sqrt{(x-3)(2-x)}\, dx =$____

1) $\pi/2$ 2) $\pi/4$ 3) $\pi/6$ 4) $\pi/8$

28. $\int_2^3 1/\sqrt{(x-3)(2-x)}\,dx =$_____

1) $\pi/2$ 2) π 3) $\pi/4$ 4) $\pi/6$

29. $\int_2^5 1/\sqrt{(x-2)(5-x)}\,dx =$_____

1) π 2) $\pi/2$ 3) $\pi/4$ 4) $\pi/6$

30. $\int_0^{\pi/2} \log \sec x\,dx =$___

1) $\pi/2$ 2) $\pi/\log 2$ 3) $\pi/2 \log 2$ 4) $\log 2$

31. $\int_0^{\pi/2} \log \operatorname{cosec} x\,dx =$_____

1) $\pi/2$ 2) $\pi/\log 2$ 3) $\pi/2 \log 2$ 4) $\log 2$

32. $\int_0^{\pi/4} \log \sin 2x\,dx =$_____

1) $\pi/2$ 2) $-\pi/4\log 2$ 3) $\pi/2 \log 2$ 4) $\log 2$

33. $\int_0^{\pi/2} \log \sin 2x\,dx =$____

1) $\pi/2$ 2) $\pi/\log 2$ 3) $-\pi/2 \log 2$ 4) $\log 2$

34. $\int_{-2}^{2} |x|/x\,dx =$____

1) 1 2) 2 3) π 4) 0

35. $\int_1^2 |x|/x\,dx =$____

1) 1 2) 2 3) 4 4) 0

36. $\int_0^1 x(1-x)^n\,dx =$____

1) $1/(n+2)$ 2) $1/(n+1)(n+2)$ 3) $2/(n+2)$ 4) $1/(n+1)$

37. $\int_0^3 x(3-x)^9\,dx =$_____

1) 3^{11} 2) $3^{11}/110$ 3) $3/110$ 4) $3^{11}/210$

38. $\int_0^{\infty} e^{-3x} \sin 4x\,dx =$_____

1)4 2)25 3)25/4 4)4/25

39. $\int_0^\infty e^{-2x} Sinxdx$ =-----

1)1/5 2)2/5 3)-2/5 4)-1/5

40. $\int_0^\infty e^{-x} Cos2xdx$ =---

1)1/5 2)-1/5 3)2/5 4)-2/5

41. $\int_0^\infty e^{-4x} \cos 5x\, dx$=____

1)4 2)4/41 3)41/4 4)1/41

42. $\int_0^{\pi/2} \sin^5 x \cos^8 x\, dx$=___

1)8/693 2)8/127 3)12/876 4)8/1287

43. $\int_0^2 x^{5/2} \sqrt{2-x}\, dx$=____

1)5π 2)5π/8 3) π/8 4) π/58

44. $\int_0^1 x^2 (1-x^2)^{5/2} dx$ =____

1)5π 2) 5π/256 3)256/π 4)256/5π

45. $\int_0^\pi \sin^7 x\, dx$ =_____

1)32 2)35 3)32/35 4)35/32

46. $\int_0^{2\pi} \sin^4 x \cos^6 x\, dx$=____

1)3π 2)3π/256 3)3π/128 4)4π/128

47. $\int_0^{\pi/2} dx/(4+5 \cos x)$=___

1)1/3 2)1/3log2 3)log2/3 4)log3/2

48. $\int_0^{\pi/2} dx/(5+4\sin x)$=_____

` 1)1/3tan-(4/5) 2)2/3cos-(4/5) 3)1/3sin-(5/4) 4)1/2tan-(3/4)

49. If f(x)=

$$\begin{vmatrix} \cos x & 1 & 0 \\ 1 & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$$

Then $\int_0^{\pi/2} f(x)dx=$_____

1)-1/3 2)3/2 3)4/5 4)6/5

50. If f(x)=

$$\begin{vmatrix} \sec^2 x & 1 & 1 \\ \cos^2 x & \cos^2 x & \operatorname{cose}^2 x \\ 1 & \cos^2 x & \cot^2 x \end{vmatrix}$$

Then $\int_0^{\pi/2} f(x)dx=$_____

1)0 2)3π/16 3)4 4)2

51 I: If f(x) is integrable on [0,a] then $\int_0^a \frac{f(x)}{f(x)+f(a-x)}\,dx = a/2$

II: If f(a+b-x)=f(x), then $\int_a^b xf(x)dx = (a+b)/2 \int_a^b f(x)\,dx$

1)only I is true 2)only II is true 3)both I and II are true 4) neither I nor II true

52. Match the following.

I. $\int_0^{\pi/2} \sqrt{1-\cos 2x}\,dx=$	a)2
II. $\int_0^{\pi/2} \sqrt{1+\sin 2x}\,dx=$	b)√2
III . $\int_0^1 \frac{x}{1+x^2}dx=$	c)log 2
IV. $\int_0^{\pi/2} \frac{\cos x}{1+\sin x}\,dx =$	d)1/2 log 2

1)a,b,c,d 2)b,c,a,d 3)b,a,d,c 4)c,d,b,a

53. Match the following.

I. $\int_0^1 \frac{1}{1+x^2}\,dx =$	a)π/4
II. $\int_0^1 \frac{x}{1+x^2}\,dx =$	b)1-π/4

III. $\int_0^1 \frac{x^2}{1+x^2}\,dx =$ c) $\prod/4$

IV. $\int_0^1 \frac{1}{(1+x^2)^2}\,dx =$ d) ½ log2

1)a,b,c,d 2)b,c,a,d 3)b,a,d,c 4)a,d,b,c

54. A: $\int_{-\pi/2}^{\pi/2} \sin x.\cosh x\,dx = 0$

R: If f(x) is an odd function then $\int_{-a}^{a} f(x)dx=0$

1) Both A and R are true and R is the correct explanation of A
2)Both A and R are true but R is not correct explanation of A
3) A is true but R is false 4) A is false but R is true

55. A: $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}\,dx = \pi/4$

R: $\int_{67.}^{\pi/2} \frac{f(\sin x)}{f(\sin x)+f(\cos x)}\,dx = \pi/4$

1) Both A and R are true and R is the correct explanation of A
2)Both A and R are true but R is not correct explanation of A
3) A is true but R is false 4) A is false but R is true

56. A : $\int_0^{\pi/2} \frac{5\tan x-3\cot x}{\tan x+\cot x}\,dx = \pi/2$

R: $\int_0^{\pi/2} \frac{a\tan x+b\cot x}{\tan x+\cot x}\,dx = (a+b)\pi/4$

1) Both A and R are true and R is the correct explanation of A
2)Both A and R are true but R is not correct explanation of A
3) A is true but R is false 4) A is false but R is true

57. A: $\int_0^{\pi/2} \sin^7 x\,dx = 16/35$

R: $\int_0^{\pi/2} \sin^n x\,dx = \frac{n-1}{n}.\frac{n-3}{n-2}.\frac{n-5}{n-4}\ldots\frac{2}{3}.1$ if n is odd.

1) Both A and R are true and R is the correct explanation of A
2)Both A and R are true but R is not correct explanation of A
3) A is true but R is false 4) A is false but R is true

58. A: $\int_0^{\pi/4} (\tan^6 x+\tan^4 x)\,dx = 1/5.$

R: $\int_0^{\pi/4} (\tan^n x+\tan^{n-2}x)dx = 1/(n-1)$.

1) Both A and R are true and R is the correct explanation of A
2)Both A and R are true but R is not correct explanation of A
3) A is true but R is false 4) A is false but R is true

PREVIOUS EAMCET PAPERS PROBLEMS

60. $\int_0^{\pi} x \sin^4 x.\, dx=$ [1996]

1)$3\pi/16$ 2)$3\pi^2/16$ 3)$16\pi/3$ 4)$16\pi^2/3$

61. $\int_0^{\pi/4} \sin^9 x dx/\cos^{11} x=$ _____ [1996]

1)1/10 2)1/20 3)1/5 4)1/6

62. $\int_0^1 dx/x+\sqrt{x} =$ _____ [1996]

1)2log2 2)2log1 3)1/2 4)1

63. $\int_0^{\pi/2} (\cos x-\sin x)\, e^x\, dx=$ ____ [1996]

1)1 2)-1 3)1/2 4) –1/2

64. $\int_{-1}^{+1} \tan^{-1} x\, dx=$ [1997]

1)0 2)$\pi/4$ 3)$\pi/2$ 4)$-\pi/4$

65. $\int_0^a \sqrt{(a^2-x^2)}dx=$ [1996, 1998]

1)$\pi a^2/4$ 2)$(1/2)\pi a^2$ 3)$(1/3)\pi a^2$ 4)$(1/4)\pi a^2$

66. $\int_0^{\pi/2} \sin^6 x \cos^5 x\, dx=$___ [1998]

1)8/693 2)5/693 3)4/693 4)10/693

67. $\int_0^{\pi/4} (\tan^4 x+\tan^2 x)dx=$ [1999]

1)1 2)1/2 3)1/3 4)1/4

68. $\int_0^{\pi} \cos^3 x\, dx=$ [1999]

1)1 2)0 3)-1 4)1/2

69. If f(x) is integrable on [0,a] then $\int_0^a f(x)dx/f(x)+f(a-x)=$ _____ [2000]

1)a/2 2)a/3 3)a/4 4)b/2

70. $\left[\sum_{n=1}^{10} \int_{-2n-1}^{2n} \sin x\, dx\right] + \left[\sum_{n=1}^{10} \int_{2n}^{2n+1} \sin x\right] =$ _____ [2000]

1)0 2)1 3)2 4)1/2

71. $\int_1 x/(1-x)^{5/4}\, dx=$ [2000]

1)16/3 2)3/16 3)-3/16 4)-16/3

72. $\int_{-1}^{1} (ax^3+bx)dx= 0$ for [2001]

1)any values of a and b 2)a>0, b>0 only 3)a>0, b<0 only 4)a<0, b<0 only

73. $\int_0^{\pi/2} \sin^8 x.\cos^2 x\, dx=$ [2001]

1)π/512 2)3π/512 3)5π/512 4)7π/512

74. $\int_{-\pi/2}^{\pi/2} \sin^4 x \cos^6 x\, dx=$____ [2002]

1)3π/128 2)3π/256 3)3π/572 4)3π/64

75. $\int_2^3 dx/(x^2-x)=$ [2002]

1)log 2/3 2)log 4/3 3)log 8/3 4)log ¼

76. $\int_0^1 \sin[2 \tan^{-1}\sqrt{[(1+x)/(1-x)]}\, dx=$ [2003]

1)π/6 2)π/4 3)π/2 4)π

77. $\int_{-2}^{2} |[x]|dx =$ _____ [2003]

1)1 2)2 3)3 4)4

78. $\int_{0}^{3} \frac{(3x+1)}{(x^2+9)} dx =$ _____ [2003]

1)$\log(2\sqrt{2}) + \pi/12$ 2)$\log(2\sqrt{2}) + \pi/2$ 3)$\log(2\sqrt{2}) + \pi/6$ 4)$\log(2\sqrt{2}) + \pi/3$

79. $\int_{0}^{2} (2x-2)dx/(2x-x^2) =$_____ [2004]

1)0 2)2 3)3 4)4

80. $\int_{-\pi/2}^{\pi/2} \log\left(\frac{2-\sin\theta}{2+\sin\theta}\right) d\theta =$_____ [2004]

1)0 2)2 3)3 4)4

81. $\int_{0}^{\pi/2} \frac{200\sin x+100\cos x}{\sin x+\cos x} dx =$_____ [2005]

1)50π 2)25π 3)75π 4)150π

82. $\int_{0}^{\pi} \frac{\theta\sin\theta d\theta}{1+\cos^2\theta} =$ _____ [2005]

1)$\pi^2/2$ 2) $\pi^2/$ 3) $\pi^2$4) $\pi^2/4$

83. $\int_{0}^{\pi/2} \frac{dx}{1+\tan^2 x} =$__ [2006]

1)π 2)$\pi/2$ 3)$\pi/4$ 4)$3\pi/2$

84. $\int_{-1}^{1} \frac{\cosh x}{1+e^{2x}} dx =$__ [2006]

1)0 2)1 3)$(e^2-1)/2a$ 4)$(e^2+2)/2a$

85. If $f(t) = \int_{-t}^{t} \frac{e^{-|x|}}{2} dx =$,then $\lim_{l\to\infty} f(t) =$ [2007]

1)1 2)1/2 3)0 4)-1

86. $\int_0^{2\pi} x\sin^6 x\cos^5 x dx =$ [2007]

1)2π 2)π/2 3)0 4)-π

87. $\int_0^1 x^{\frac{3}{2}}\sqrt{1-x}dx =$ [2008]

1)π/6 2)π/9 3) π/12 4)π/16

88. $\int_{-\pi/2}^{\pi/2} \sin|x|dx =$ [2008]

1)0 2)1 3)2 4) π

89. $\int_0^{\pi} \frac{1}{1+\sin x}dx =$ [2009]

1) 1 2) 2 3) –1 4) –2

90. If $I_n = \int_0^{\frac{\pi}{4}} \tan^n x dx$, then $I_2 + I_4$, $I_3 + I_5$, $I_4 + I_6$, ……are in : [2010]

1) arithmetic progression 2) geometric progression
3) harmonic progression 4) AGP

91. If $I_n = \int_0^{\pi/4} \tan^n \theta d\theta$ for n = 1, 2, 3, ……. Then $I_{n-1} + I_{n+1}$ = ……. [2011]

1) 0 2) 1 3) $\frac{1}{n}$ 4) $\frac{1}{n+1}$

92. The area (in square units) of the region bounded by the curves $x = y^2$ and $x = 3 - 2y^2$ is [2011]

1) $\frac{3}{2}$ 2) 2 3) 3 4) 4

93. The area (in square units) bounded by the curces $y^2 = 4x$ & $x^2 = 4y$ is [2012]

1) $\frac{64}{3}$ 2) $\frac{16}{3}$ 3) $\frac{8}{3}$ 4) $\frac{2}{3}$

94. The value of the integral $\int_0^4 \frac{dx}{1+x^2}$ obtained by using Trapezoidal rule with h = 1 is [2012]

1) $\frac{63}{85}$ 2) $\tan^{-1}(4)$ 3) $\frac{108}{85}$ 4) $\frac{113}{85}$

95. The area (in square units) bounded by the curves $x = -2y^2$ & $x = 1- 3y^2$ is [2013]

1) $\frac{2}{3}$ 2) 1 3) $\frac{4}{3}$ 4) $\frac{5}{3}$

96. If $\int_0^b \frac{dx}{1+x^2} = \int_b^\infty \frac{dx}{1+x^2}$, then b = [2013]

1) $\tan^{-1}\left(\frac{1}{3}\right)$ 2) $\frac{\sqrt{3}}{2}$ 3) $\sqrt{2}$ 4) 1

97. By the definition of the definite integrals, the value of the definite integral, the value of $\lim_{n\to\infty}\left(\frac{1^3}{1^5+n^5}+\frac{2^5}{2^5+n^5}+\frac{3^5}{3^5+n^5}+.....+\frac{n^4}{n^5+n^5}\right)$ is **(2014)**

1) $\frac{1}{5}\log 2$ 2) $\frac{1}{4}\log 2$ 3) $\frac{1}{3}\log 2$ 4) $\log 2$

98. $\int_0^{\pi/2} \cos^4 3\theta \sin^2 6\theta d\theta =$ **(2014)**

1) $\frac{5}{192}$ 2) $\frac{5\pi}{256}$ **3)** $\frac{5\pi}{192}$

4) $\frac{\pi}{96}$

99. $\int_0^{\pi/2} \frac{16x \sin x \cos x}{\sin^4 x + \cos^4 x} dx =$ **(2015)**

1) $\frac{\pi^2}{4}$ 2) $\frac{\pi^2}{2}$ **3)** π^2 4) $2\pi^2$

100. $\int_0^1 \sqrt{\frac{1-x}{1+x}} dx =$ **(2015)**

1) $\frac{\pi}{2}-1$ 2) $\frac{\pi}{2}+1$ 3) $\pi-1$ 4) $\frac{3\pi}{2}$

101. $\int_0^{\pi/4} \frac{\sin x + \cos x}{3+\sin 2x} dx =$ **(2015 A.P)**

1) $\frac{1}{2}\log 3$ 2) $\log 2$ 3) $\log 3$ **4)** $\frac{1}{4}\log 3$

102. $\int \frac{\sqrt{1+x+x^2}-\sqrt{1-x+x^2}}{\sqrt{1+x+x^2}+\sqrt{1-x+x^2}} dx =$ **(2015 A.P)**

1) $\frac{3\pi}{2}$ 2) $\frac{\pi}{2}$ **3) 0** 4) -1

103. $\int_0^{\pi/4} \frac{\sin x + \cos x}{7 + 9\sin 2x} dx =$ (2016)

1) $\frac{\log 3}{4}$ 2) $\frac{\log 3}{36}$ 3) $\frac{\log 7}{12}$ 4) $\frac{\log 7}{24}$

104. $\int_0^{\pi/4} \left[\sqrt{\tan x} + \sqrt{\cot x}\right] dx =$ (2016)

1) $\frac{\pi}{\sqrt{2}}$ 2) $\frac{\pi}{2}$ 3) $\frac{3\pi}{\sqrt{2}}$ 4) π

105. If the area bounded by the curves $y = ax^2$ & $x = ay^2$, $(a > 0)$ is 3 sq. units, then the value of a is (2016)

1) $\frac{2}{3}$ 2) $\frac{1}{3}$ 3) 1 4) 4

106. The area included between the parabola $y = \frac{x^2}{4a}$ & the curve $y = \frac{8x^2}{\left(x^2 + 4a^2\right)}$ is (2016AP)

1) $a^2\left(2\pi + \frac{2}{3}\right)$ 2) $a^2\left(2\pi - \frac{8}{3}\right)$ 3) $a^2\left(\pi + \frac{4}{3}\right)$ 4) $a^2\left(2\pi - \frac{4}{3}\right)$

107. By the definition of the definite integral, the value of (2016AP)

$$\lim_{x\to\infty}\left(\frac{1}{\sqrt{n^2-1}} + \frac{1}{\sqrt{n^2-2^2}} + \ldots\ldots\ldots\ldots\ldots\ldots + \frac{1}{\sqrt{n^2-(n-1)^2}}\right) =$$

1) π 2) $\frac{\pi}{2}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{6}$

108. $\int_{-\pi/4}^{\pi/4} \left(\frac{x + \frac{\pi}{4}}{2 - \cos 2x}\right) dx =$ (2016AP)

1) $\frac{8\pi\sqrt{3}}{5}$ 2) $\frac{2\pi\sqrt{3}}{9}$ 3) $\frac{4\pi^2\sqrt{3}}{9}$ 4) $\frac{\pi^2}{6\sqrt{3}}$

109. $\int_0^{\pi} \frac{x dx}{4\cos^2 x + 9\sin^2 x} =$ (2017)

1) $\frac{\pi^2}{12}$ 2) $\frac{\pi^2}{4}$ 3) $\frac{\pi^2}{6}$ 4) $\frac{\pi^2}{3}$

110. $\lim_{n\to\infty}\left[\frac{1}{n}+\frac{1}{n+1}+\frac{1}{n+2}+.....+\frac{1}{3n}\right]=$ (2017AP)

1) $\log 2$ 2) $\log 3$ 3) $\log 4$ 4) $\log 5$

111. $\int_{-2}^{3}\left|1-x^2\right|dx=$ (2017AP)

1) $\frac{28}{3}$ 2) $\frac{14}{3}$ 3) $\frac{7}{3}$ 4) $\frac{1}{3}$

112. $\int_{0}^{\pi}\frac{x\sin x}{1+\cos^2 x}dx=$ (2017 AP)

1) $\frac{\pi^2}{4}$ 2) $\frac{\pi^2}{2}$ 3) $\frac{\pi^2}{3}$ 4) π^2

KEY

1. 1	2. 3.	3. 1	4. 3	5. 4	6. 2	7. 1	8. 3	9. 1	10. 4
11. 3	12. 4	13. 1	14. 1	15. 2	16. 1	17. 2	18. 2	19. 2	20. 2
21. 1	22. 4	23. 3	24. 1	25. 3	26. 3	27. 4	28. 2	29. 1	30. 3
31. 3	32. 2	33. 3	34. 4	35. 1	36. 2	37. 1	38. 4	39. 1	40. 1
41. 2	42. 4	43. 2	44. 2	45. 3	46. 3	47. 2	48. 1	49. 1	50. 2
51. 3	52. 3	53. 1	54. 1	55. 3	56. 3	57. 1	58. 1	59. 2	60. 1
61. 1	62. 1	63. 2	64. 1	65. 1	66. 1	67. 3	68. 2	69. 1	70. 1
71. 4	72. 4	73. 2	74. 2	75. 2	76. 2	77. 4	78. 2	79. 1	80. 1
81. 3	82. 4	83. 3	84. 3	85.	86. 3	87. 4	88. 3	89. 2	90. 3
91. 3	92. 1	93. 2	94. 4	95. 3	96. 4	97. 1	98. 3	99. 3	100. 1
101. 4	102. 3	103.4	104.1	105.2	106.4	107.2	108.4	109.1	110.2
111. 1	112. 1								

Exercise-B

1. The value of integral $\int_{0}^{\pi}\frac{dx}{1+\sin x}=$

1) 0 2) 1/2 3) 2 4)1

2. $\int_{0}^{1}\frac{dx}{\left(x^2+1\right)^{3/2}}=$

1) 1 2) $1/\sqrt{2}$ 3) 1/2 4) 3/2

3. The value of the integral $\int_{0}^{1}\frac{\sqrt{x}}{1+x^2}dx$ is

1) $\frac{\pi}{2}+\frac{1}{2}\log\left(\sqrt{2}+1\right)$ 2) $\frac{\pi}{2\sqrt{2}}+\frac{1}{2\sqrt{2}}\log\left(\sqrt{2}+1\right)$ 3) $\frac{\pi}{2}+\frac{1}{\sqrt{2}}\log\left(\sqrt{2}+1\right)$ 4)0

4. The vaue of the integral $\int_0^{\pi}\frac{xdx}{1+\cos\alpha\sin x}, 0<\alpha<\pi$ is:

1) $\frac{\pi\alpha}{\sin\alpha}$ 2) $\frac{\pi\alpha}{1+\sin\alpha}$ 3) $\frac{\pi\alpha}{\cos\alpha}$ 4) $\frac{\pi\alpha}{1+\cos\alpha}$

5. The value of the integral $\int_0^2 |1-x|dx =$

1) Zero 2) 1 3) 2 4) -1

6. $\int_0^4 2^{[x]}dx =$_____ (where [x] is the greater integer not more than x)

1) 16 2) 15 3) 7 4) 3

7. $\underset{n\to\infty}{lt}\left(\frac{r}{n}\right)^{1/n}$

1) e 2) e^{-1} 3) 1 4) -1

8. If $g(x)=\int_0^x \cos^4 tdt$ then g(x+ π)=

1) g(x)+g(π) 2) g(x)-g(π) 3) f(x)g(π) 4) $\frac{g(x)}{f(\pi)}$

9. The value of $\int_0^{4a}\operatorname{cosec}(x-3a).\operatorname{cosec}(x-2a)dx =$

1) $\operatorname{cosec}a\log\left(\frac{1}{2}\sec a\right)$ 2) $2\operatorname{cosec}a.\log\left(\frac{1}{2}\sec a\right)$

3) $2\operatorname{cosec}a.\log\sec a$ 4) None of the above

10. The value of the integral $\int_{-1}^{3}\left(\tan^{-1}\frac{x}{x^2+1}+\tan^{-1}\frac{x^2+1}{x}\right)=$

1) π 2) 2π 3) 4π 4) None of these

11. $\int_0^1 \log\left[\sqrt{1-x}+\sqrt{1+x}\right]=$

1) $\frac{1}{2}\left[\log 2-\frac{\pi}{2}+1\right]$ 2) $\frac{1}{2}\left[\log 2+\frac{\pi}{2}+1\right]$

3) $\frac{1}{2}\left[\log 2+\frac{\pi}{2}-1\right]$ 4) None of these

12. Match the following.

I. $\int_0^1 \frac{1}{1+x^2}dx =$ a) $\frac{\pi}{4}$

II. $\int_0^1 \frac{x}{1+x^2}dx =$ b) $1-\frac{\pi}{4}$

III. $\int_0^1 \frac{x^2}{1+x^2}dx =$ c) $\frac{\pi}{8}+\frac{1}{4}$

IV. $\int_0^1 \frac{1}{\left(1+x^2\right)^2}dx =$ d) $\frac{1}{2}\log 2$

1)a,b,c,d 2)b,c,a,d 3)b,a,d,c 4)a,d,b,c

13. $\int_{\sqrt{3}}^{\sqrt{13}} [x]dx =$

1) $3\sqrt{13}-\sqrt{3}-5$ 2) $\sqrt{13}-\sqrt{3}$ 3) 6 4) $3\sqrt{13}-2\sqrt{3}-9$

14. $\int_0^2 dx/(x+\sqrt{4-x^2}) =$ _____

1) π/4 2) π/2 3) π/3 4) π/6

15. $\int_a^b f(a+b-x)/(f(x)+f(a+b-x))\,dx=$_____

1)b-a 2)(b-a)/2 3)a/2 4)b/2

16. $\int_0^{\pi/2} \sec^{5/7} x/(\sec^{5/7} x+\operatorname{cosec}^{5/7} x)\,dx =$_____

1) π/2 2) π/4 3) π/6 4) π/8

17. $\int_0^a \frac{dx}{x+a} =$

1)-log 1 2)log1 3)-log2 4)log2

18. $\int_1^2 \frac{dx}{x\sqrt{x^2-1}} =$

1)π/3 2)π/4 3)π/2 4)π

19. $\int e^{2\log x}\,dx =$

1)$x^2/2+C$ 2)$x^{-3}/-3+C$ 3)$x^3/3+C$ 4) $\pi/4+C$

20. $\int \frac{x^2-1}{x^2+1}dx\int =$

1)$x-2\tan^{-1}x+C$ 2)$x+\tan^{-1}+C$ 3)$x+2\tan^{-1}x+C$ 4) 0

21. $\int_0^{\pi/2} \cos^2 x dx=$

1)$\pi/2$ 2)π 3)$\pi/4$ 4)$\pi/3$

22. $\int_0^2 (1-x)\,dx=$

1)1 2)0 3)2 4)-1

23. $\int_0^1 \mathrm{Tan}^{-1}x\,dx=$

1)$\pi/4$ 2)$\pi/4+\log 2$ 3)$\pi/4-1/2\log 2$ 4)$\pi/2+\log 2$

24. $\int_0^{\pi/2} (\cos x-\sin x)e^x dx=$

1)0 2)1 3)-1 4)2

25. $\int_0^2 \frac{2x-2}{2x-x^2}dx=$

1)0 2)2 3)3 4)4

26. $\int_{-\pi/2}^{\pi/2} \log\left(\frac{2-\sin\theta}{2+\sin\theta}\right) d\theta =$

1)0 2)1 3)2 4)-1

27. I : $\int_0^{\pi/2} \sin^6 x\cos^5 x dx= 8/693$

II: $\int_0^{\pi/4} \frac{\sin^9 x}{\cos^{11} x}\,dx= 1/10.$

1)only I is true 2)only II is true 3)both I and II are true 4) neither I nor II true

KEY

1) 3	2) 2	3) 2	4) 1	5) 2	6) 2	7) 2	8) 1	9) 4	10) 2
11) 3	12) 2	13) 4	14) 1	15) 2	16) 2	17) 4	18) 1	19) 3	20) 1
21) 3	22) 2	23) 3	24) 3	25) 1	26) 1	27) 3			

AIEEE PROBLEMS

1. The value of $\int_{-\rho}^{\pi} \frac{\cos^2 x}{1+a^x} dx,\ a > 0$ is [2005]

   1) $a\pi$ 2) $\pi/2$ 3) π/a 4) 2π

2. If $f(y) = e^y$, $g(y) = y$: $y > 0$ and $F(t) = \int_0^t f(t-y)g(y)dy$, then [2003]

   1) $F(t) = e^t - (1+t)$ 2) $F(t) = t\,e^t$ 3) $F(t) = t\,e\text{-}^t$ 4) $F(t) = 1 - e^t - (1+t)$

3. Let $F(x) = f(x) + f(1/x)$, where $f(x) = \int_1^x \frac{\log t}{1+t} dt$. Then $F(e) =$ [2007]

   1) 1/2 2) 0 3) 1 4) 2

4. The solution for x of the equation $\int_{\sqrt{2}}^{x} \frac{dt}{t\sqrt{t^2-1}} = \frac{\pi}{2}$ is [2007]

   1) $-\sqrt{2}$ 2) π 3) $\sqrt{3}/2$ 4) $2\sqrt{2}$

5. $\int_0^{\pi} xf(\sin x)dx =$ [2006]

   1) $\frac{\pi}{2}\int_0^{\pi/2} f(\sin x)dx$ 2) $\pi\int_0^{\pi/2} f(\cos x)dx$

   3) $\pi\int_0^{\pi} f(\cos x)dx$ 4) $\pi\int_0^{\pi} f(\sin x)dx$

6. If $(a + b - x) = f(x)$. then $\int_a^b xf(x)dx =$ [2003]

   1) $\frac{a+b}{2}\int_a^b f(x)dx$ 2) $\frac{b-a}{2}\int_a^b f(x)dx$

   3) $\frac{a+b}{2}\int_a^b f(a+b-x)dx$ 4) $\frac{a+b}{2}\int_a^b f(b-a)dx$

7. The value of the integral, $\int_3^6 \frac{\sqrt{x}}{\sqrt{9-x}+\sqrt{x}} dx$ is [2006]

   1) 2 2) 1 3) 1/2 4) 3/2

8. If $f(x) = \frac{e^x}{1+e^x} I_1 = \int_{f(-a)}^{f(a)} xg\{x(1-x)\}dx$ and $I_2 = \int_{f(-a)}^{f(a)} g\{x(1-x)\}dx$, then the value of $\frac{I_2}{I_1}$ is [2004]

1) 2 2) 1 3) –1 4) 3

9. $\int_{-3\pi/2}^{-\pi/2} \left[(x+\pi)^3 + \cos^2(x+3\pi)\right] dx =$ [2006]

1) $\pi/2$ 2) $(\pi/4)-1$ 3) $\pi^4/32$ 4) $(\pi^4/32)+(\pi/2)$

10. Let $f(x)$ be a function satisfying $f'(x) = f(x)$ with $f(0) = 1$ and $g(x)$ be a function that satisfies $f(x) + g(x) = x^2$. Then the value of the integral $\int_0^1 f(x)g(x)dx$, is [2003]

1) $e+\frac{e^2}{2}-\frac{3}{2}$ 2) $e-\frac{e^2}{2}-\frac{3}{2}$ 3) $e+\frac{e^2}{2}+\frac{5}{2}$ 4) $e-\frac{e^2}{2}-\frac{5}{2}$

11. The value of $\int_{-2}^{3} \left|1-x^2\right| dx$ is [2004]

1) $\frac{28}{3}$ 2) $\frac{1}{3}$ 3) $\frac{7}{3}$ 4) $\frac{14}{3}$

12. If $f(x) = \begin{cases} xe^{-\left(\frac{1}{|x|_0}+\frac{1}{x}\right)}, & x \neq 0 \\ & x = 0 \end{cases}$, then $f(x)$ *is* [2003]

1) continuous for all x but not differentiable at $x = 0$
2) neither differentiable nor continous at $x = 0$
3) discontinuous everywhere
4) continuous as well as differentiable for all x

13. If $I_1 = I_1 = \int_0^1 2^{x^2} dx, I_2 = \int_0^1 2^{x^3} dx, I_3 = \int_1^2 2^{x^2} dx$ and $I_4 = \int_1^2 2^{x^3} dx$, then [2005]

1) $I_1 > I_2$ 2) $I_2 > I_1$ 3) $I_3 > I_4$ 4) none

14. Let $f : R \to R$ be a differentiable function having $f(2) = 6$, $f'(2) = \left(\frac{1}{48}\right)$. Then $\underset{x \to 2}{Lt} \int_6^{f(x)} \frac{4r^3}{x-2} dt =$ [2005]

1) 24 2) 36 3) 12 4) 18

15. The value of the integral $I = \int_0^{\pi/2} x(1-x)^n dx$ is [2003]

1) $\frac{1}{n+2}$ 2) $\frac{1}{n+1} - \frac{1}{n+2}$ 3) $\frac{1}{n+1} + \frac{1}{n+2}$ 4) $\frac{1}{n+1}$

16. The value of $\int_0^a [x] f'(x) dx$, $a > 1$, where $[x]$ denotes the greatest integer not exceeding x is [2006]

1) $[a] f([a]) - \{f(1) + f(2) + \ldots + f(a)\}$ 2) $a f([a]) - \{f(1) + f(2) + \ldots + f(a)\}$
3) $a f(a) - \{f(1) + f(2) + \ldots + f([a])\}$ 4) $[a] f(a) - \{f(1) + f(2) + \ldots + f([a])\}$

KEY

1) 2	2) 1	3) 1	4) 1	5) 2	6) 1	7) 4	8) 1	9) 1	10) 2
11) 1	12) 1	13) 1	14) 4	15) 1	16) 4				

PROBLEMS ON AREAS
Exercise

1. Area enclosed by the curve $x^2+y^2=36$ is _____
1)5π 2)10π 3)20π 4)36π

2. Area under $x^2+y^2=16$ and x-axis is ___
1) 8π 2)4π 3)3π 4)6π

3. Area under $x^2+y^2=4$, x-axis and the line x=0, x=2 is _____
1)2π 2)4π 3) π 4) π/2

4. Area enclosed by the curve x=5 cos θ, y= 5 sin θ where $0 \le \theta \le 2\pi$ is _
1)5π 2)25π 3)15π 4)20π

5. Area bounded by the circle $x^2+y^2=4$ in I quadrant and the line y=√3 x and x-axis is
1) π 2)2π/3 3)3π/2 4)4π

6. Area enclosed in I quadrant of the $x^2+y^2=16$, line x=√3 y and x-axis is __
1)2π/3 2)3π/4 3)4π/3 4)4π/2

7. Area enclosed by the circle $x^2+y^2=25$ in I quadrant, line y=x and x-axis is _____
1)25π/8 2)8π/25 3)8π 4)25π

8. Area bounded by $9x^2+4y^2=36$ is _____
1)3π 2)6π 3)9π 4)12π

9. Area bounded by ellipse $9x^2+16y^2=144$ in positive quadrant is _____
1)3π 2)4π 3)6π 4)4π

10. Area enclosed in positive quadrant between $x/a+y/b=1$ and ellipse $x^2/a^2+y^2/b^2=1$ is
1)$ab/4\pi$ 2)$ab/2\pi$ 3)$(ab/4)(\pi-2)$ 4)$(ab/2)(\pi-2)$

11. Area bounded between $x=3\cos\theta$, $y=5\sin\theta$ where $\theta\in[0,2\pi]$ is ____
1)5π 2)15π 3)20π 4)25π

12. Area bounded by the curves $y^2=8x$ and $x^2=8y$ is _____
1)3/64 2)12/35 3)64/3 4)3/35

13. Area bounded by the curves $y^2=x$ and $x^2=y$ is _____
1)1/2 2)2/3 3)1/3 4)3/2

14. Area bounded by the curves $x= 2\sqrt{y}$, $y = 2\sqrt{x}$ is ____
1)14/3 2)16/3 3)3/16 4)16

15. Area bounded by the parabola $y^2=4ax$ and its L.R is _____
1)8a/3 2)$8a^3/3$ 3)$8a^2/3$ 4)$3/8a^2$

16. Area bounded by $y^2=8x$ and the line $x=2$ is _____
1)14/3 2)16/3 3)3/16 4)16

17. Area bounded by the curve $x^2=8y$, $x=4$ and x-axis is _____
1)3/8 2)2/3 3)3/4 4)8/3

18. Area bounded by the curve $y=\sin x$ for $x=0$ to $x= 2\pi$ is _____
1)2 2)4 3)6 4)8

19. Area under the curve $y=\sin x$ for $-\pi\leq x\leq 2\pi$ is ____
1)2 2)4 3)6 4)8

20. Area under the curves $y=\sin x$, $y=\cos x$ and first point where they meet for $x >0$ is
1)$\sqrt{2}-1$ 2)$\sqrt{2}$ 3)$\sqrt{2}+1$ 4)$2\sqrt{2}$

21. Area bounded by the parabola $y^2=x$ and line $y=x$ is _____
1)1/3 2)1/5 3)1/6 4)2/5

22. Area bounded by the curve $y=4x-x^2$ and the x-axis is _____

1)32/2 2)32/3 3)3/32 4)4/35

23. I: The area of the region bounded by the curve $x^2 = 4y$, the line x = 2 and x- axis is 2/3 sq. unit.
II: The area of the region bounded by $x^2=8y$, x=4 and x-axis is 8/3 sq.unit.
1)only I is true 2)only II is true 3)both I and II are true 4)neither I nor II true

24. Match the following:

Curves	Area of the region
I. $y=4x-x^2, y=5-2x$	a)4/3
II. $y=3x, y=6x-x^2$	b)9/2
III. $y=x^3, y=2x^2$	c)32/3

1)a,b,c 2)b,c,a 3)c,b,a 4)a,c,b

25. A: The area of the region bounded by $y^2=4x$, $x^2=4y$ is 16/3.
R: The area of the region bounded by $y^2=4ax, x^2=4by$ is 16ab/3
1) Both A and R are true and R is the correct explanation of A
2)Both A and R are true but R is not correct explanation of A
3) A is true but R is false
4) A is false but R is true

26. Dividing [0,4] into 4 equal parts and using Trapezoidal rule,
approximate value of $\int_0^4 x^2 dx$=___
1)11 2)22 3)23 4)25

27. Dividing [1,5] into 4 equal parts, using Simpson rule,
approximate value of $\int_1^5 1/x\, dx$ = ___
1)1.622 2)1.78 3)1.67 4)2.12

28. $\lim_{n\to\infty} [1/(2n+1)+1/(2n+2) +\ldots + 1/(2n+n)]$ =_____
1)log2 2)log3/2 3)log2/3 4)log3

29. $\lim_{n\to\infty} [(n+1)/(n^2+1^2)+ (n+2)/(n^2+2^2) +\ldots\ldots+1/n]$ =_____
1) $\pi/4$ 2) $\pi/4+\log 2$ 3) $\pi/4+1/2\log 2$ 4) 4π

30. Area between $|x|/a + |y|/b = 1$ is _____
1)2ab 2)4ab 3)ab 4)3ab

31. Area between $|x| + |y| = 1$ is _____
1)1 2)2 3)3 4)4

32. The area contained between the curve $xy = a^2$, the vertical line $x = a$, $x = 4a(a>0)$ and x-axis is [1985]
1)$a^2 \log 2$ 2)$2a^2 \log 2$ 3)$a \log 2$ 4)$2a \log 2$

33. The area bounded by the curve $\sqrt{x}+\sqrt{y}=\sqrt{a}$ (x,y > 0) and the coordinate axes is [1986]
1)a^2 2)$a^2/2$ 3)$a^2/3$ 4)$a^2/6$

34. $\underset{n\to\infty}{Lt}$ $[1/\sqrt{(n^2-1^2)}+1/\sqrt{(n^2-2^2)}+\ldots\ldots\ldots 1/\sqrt{(2n-1)}]=$_____ [1987]
1) π 2) $\pi/2$ 3)2π 4)4π

35. $\underset{n\to\infty}{Lt}\left\{\frac{1}{n}+\frac{1}{n+1}+\frac{1}{n+2}+....+\frac{1}{3n}\right\}=$ [1988]
1)$\pi/4$ 2)$\pi/6$ 3)log 2 4)log 3

36. The area of the region bounded by $a^2 y^2 = x^2(a^2-x^2)$ is [1988]
1) $a^2/3$ 2)$2a^2/3$ 3)$4a^2/3$ 4)none

37. The area of the portion of the circular disc of radius *a* cut off between the chords of the length *a* and *a/2* is [1989]
1) $\frac{\sqrt{15}}{16}a^2-\frac{\sqrt{3}}{4}a^2-\frac{\pi}{3}a^2+a^2\sin^{-1}\frac{\sqrt{15}}{4}$ 2) $\frac{\sqrt{15}}{32}a^2-\frac{\sqrt{3}}{8}a^2$
3) $\frac{\pi}{6}a^2-\frac{a^2}{2}\sin^{-1}\frac{\sqrt{15}}{4}$ 4) none

38. A curve is drawn to pass through the points given by the following table

x	*1*	*1.5*	*2*	*2.5*	*3*	*3.5*	*4*
y	*2*	*2.4*	*2.7*	*2.8*	*3*	*2.6*	*2*

The area bounded by the curve, the x-axis and the lines x = 1, x = 4 by using Trapezoidal rule is [1989]
1)7.78 sq.unit 2)8.77 sq.unit 3)7.75 sq.unit 4)87.7 sq.unit

39. The area enclosed between the parabola $y^2 = 4ax$ and the lines x =a, x= 9a is
1)$8a^2$ 2)$8a^2/3$ 3)$208a^2/3$ 4) a^2 [1990]

40. Area under the curve y=1-|x| and x-axis is _____ [1991]
1)1 2)4 3)2 4)0

41. The Approximate value of $\int_1^3 \frac{dx}{2x-1}$ by using trapezoidal rule with 4 intervals is___

1)0.7111 2)0.8111 3)0.1712 4)0.2412 [1991]

42. The area bounded by y=cosx, y =x +1, y = 0 is [1993]
1)3/2 2)2/3 3)1/2 4)5/2

43. A river is 40 metre wide. The depth *d* in metres at a distance *x* metres from a bank is given in the following table.Using Simpson's rule, estimate the area of cross section of the river in square metres is [1994]

x	*0*	*10*	*20*	*30*	*40*
d	*0*	*4*	*16*	*6*	*0*

1)280 2)260 3)240 4)220

44. The value of $\int_0^4 e^x dx$ on using Simpson's 1/3 rd rule by taking h =1 [Given e =2.72, e^2 =7.39, e^3 =20.09, e^4 = 54.60] approximately us [1995]
1)59.325 2)53.875 3)58.873 4)57.325

45. Area bounded by the curves y^2=4ax and x^2=4ay is _____ [1996]
1)$16a^2/3$ 2)$3/16a^2$ 3)$3a^2$ 4)$16a^2$

46. Area bounded by the x-axis and the curve y=4x-x^2-3 is_____ [1996]
1)2 2)3 3)4/3 4)3/2

47. The area bounded by the curve y =x and y = x^3 is [1996]
1)1/4 2)1/6 3)1/12 4)1/2

48. AOB is the positive quadrant of the ellipse $x^2/a^2 + y^2/b^2 = 1$, where OA = a, OB = b. The area between the arc AB and the chord AB of the ellipse is [1996]
1)πab 2)(π-2)ab 3)(π-2)ab/2 4)(π-2)ab/4

49. f(x) = 1/(1+x) for $0 \le x \le 1$ and the interval (0,1) is divided into 2 equal subintervals. Using the trapezoidal rule , the value of $\int_0^1 \frac{dx}{1+x}$ is [1996]
1)17/6 2)17/12 3)17/24 4)17/48

50. Area bounded by the curve y= 1+(8/x^2) with x-axis and the ordinate at x=2 and x=4 is __ [1996, 1997]
1)2 2)3 3)4 4)5

51. Area bounded by y=3x and y=x^2 is ____ [1998]
1)10 2)5 3)4.5 4)9

52. Area bounded by the parabola x=4-y^2 and y-axis is _____ [1999]
1)3/32 2)32/3 3)33/2 4)16/4

53. $\underset{n\to\infty}{Lt}$ [1/(n+1)+1/(n+2) +…. + 1/2n] =_____ [1999]

1)log 2 2)log 3 3)log 4 4)log 8

54. $\underset{n\to\infty}{Lt} \sum_{r=1}^{n} 1/n \sqrt{(n+r)/(n-r)}$ [1999]

1)π 2) π/2 3) π/2+1 4) 2π

55. Evaluate $\int_{-3}^{3} x^4\, dx$ using simpson's rule by taking n=6. [1999]

1)11.5 2)98 3)115 4)120

56. Area bounded by x^2=4y, line x=2 and x-axis is _____ [2000]

1)1/3 2)2/3 3)4/3 4)3/4

57. Area bounded by $y=x^3$, $y=x^2$ and the ordinate x=1,x=2 is_____ [2000]

1)17/12 2)21/3 3)3/21 4)12/117

58. . $\underset{n\to\infty}{Lt}\left\{\frac{1}{2n+1}+\frac{1}{2n+2}+\frac{1}{2n+3}+....+\frac{1}{2n+n}\right\}=$ [2000]

1)$\log_e\left(\frac{1}{3}\right)$ 2) $\log_e\left(\frac{2}{3}\right)$ 3) $\log_e\left(\frac{3}{2}\right)$ 4) $\log_e\left(\frac{4}{3}\right)$

59.

X	1	2	3	4
Y	0.7111	0.7222	0.7333	0.7444

Use trapezoidal rule and find $\int_{1}^{4} y\, dx$. [2001]

1)0.1833 2)1.1833 3)2.1883 4)1.3833

60. Approximate value of $\int_{1}^{9} x^2\, dx$ by using trapezoidal rule with 4 intervals is___ [2002]

1)244 2)144 3)148 4)248

61. If [2,6] is divided into 4 intervals, evaluate $\int_{2}^{6} 1/(x^2-x)\, dx$ using simpson 's [2003]

1)47 2)90 3)47/90 4)90/47

62. The area of the region bounded by x^2+2, X-axis,x=1 and x=2 is [2004]

1)16/3 2)17/3 3)13/3 4)20/3

63. The area (in square units) bounded by the curves $y^2=4x$ and $x^2=4y$ in the plane is: (2005)

1)8/3 2)16/3 3)32/3 4)64/3

64. Dividing the interval [0,6] into 6 equal parts and by using trapezoidal rule the value of

$\int_0^6 x^2\,dx$ is approximately: (2006)

1)330 2)331 3)332 4)333

65. The area (in square units) of region enclosed by the curve $y = x^2$ and $y = x^3$ is

1)1/12 2)1/6 3)1/3 4)1 (2007)

66. The area of the region bounded by the curves $2x = y^2-1$ and $x=0$ is (2008)

1)1/3 2)2/3 3)1 4)2

67. The line $x = \frac{\pi}{4}$ divides the area of the region bounded by $y = \sin x$, $y = \cos x$ and x-axis $\left(0 \le x \le \frac{\pi}{2}\right)$ into two regions of areas A_1 and A_2. Then $A_1 : A_2 =$ (2009)

1) 4:1 2) 3:1 3) 2:1 4) 1:1

68. The velocity of a particle which starts from rest is given by the following table:

t (in seconds) :	0	2	4	6	8	10
v (in m/sec) :	0	12	16	20	35	60

The total distance travelled (in meters) by the particle in 10 seconds, using Trapezoidal rule is given by: (2009)

1) 113 2) 226 3) 143 4) 246

69. The area (in square units) of the region enclosed by the two circles $x^2 + y^2 = 1$ and $(x-1)^2 + y^2 = 1$ is : (2010)

1) $\frac{2\pi}{3}+\frac{\sqrt{3}}{2}$ 2) $\frac{\pi}{3}+\frac{\sqrt{3}}{2}$ 3) $\frac{\pi}{3}-\frac{\sqrt{3}}{2}$ 4) $\frac{2\pi}{3}-\frac{\sqrt{3}}{2}$

70. The values of a function f(x) at different values of x are as follows: (2010)

x :	0	1	2	3	4	5
f(x) :	2	3	6	11	18	27

then the approximate area (in square units) bounded by the curve y = f(x) and X – axis between x = 0 and 5, using the Trapezoidal rule is:

1) 50 2) 75 3) 52.5 4) 62.5

71. The area (in square units) of the region bounded by the curves $x = y^2$ and $x = 3 - 2y^2$ is [2011]

1) $\frac{3}{2}$ 2) 2 3) 3 4) 4

72. The area (in square units) bounded by the curves $x = -2y^2$ & $x = 1- 3y^2$ is [2013]

1) $\frac{2}{3}$ 2) 1 3) $\frac{4}{3}$ 4) $\frac{5}{3}$

73. The area (in square units) of the region bounded by x=-1, x=2, $y= x^2+1$ & y=2x–2 is (2014)

1) 7 2) 8 3) 9 4) 10

74. The area of the region bounded by the cirves $y = 9x^2$ & $y = 5x^2 + 4$ (in squares units) is (2015)

1) 64 2) $\frac{64}{3}$ 3) $\frac{32}{3}$ 4) $\frac{16}{3}$

75. The area of the region described by $\{(x,y)/x^2+y^2 \le 1 \& y^2 \le 1-x\}$ is (2015 A.P)

1) $\frac{\pi}{2}-\frac{2}{3}$ 2) $\frac{\pi}{2}+\frac{2}{3}$ 3) $\frac{\pi}{2}+\frac{4}{3}$ 4) $\frac{\pi}{2}-\frac{4}{3}$

76. The area of the region bounded by the curves $x = y^2 – 2$ & x = y is (2017)

1) $\frac{9}{4}$ 2) 9 3) $\frac{9}{2}$ 4) $\frac{9}{7}$

77. The differential equation corresponding to the family of circles given by $(x – a)^2 + (y – b)^2 = 4$ where a & b are parameters is (2017AP)

1) $4\frac{d^2y}{dx^2}+9y=0$ 2) $4\left(\frac{d^2y}{dx^2}\right)^2=\left[1+\left(\frac{dy}{dx}\right)^2\right]^3$

3) $4\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^2=6y$ 4) $4\left(\frac{d^2y}{dx^2}\right)^2+\left[1+\left(\frac{dy}{dx}\right)^2\right]^2=0$

78. The general solution of $\cos^2 x\frac{dy}{dx}+y=\tan x$ is (2017AP)

1) $ye^{\tan x}=(\tan x-1)e^{\tan x}-\tan x+c$ 2) $ye^{\tan x}=(\tan x+1)e^{\tan x}+\tan x+c$

3) $ye^{\tan x}=(\tan x-1)e^{\tan x}+c$ 4) $ye^{\tan x}=(\tan x-1)e^{\tan x}+\tan x+c$

KEY

1. 4	2. 1	3. 3	4. 2	5. 2	6. 3	7. 1	8. 2	9. 1	10. 3
11. 2	12. 3	13. 3	14.2	15. 3	16. 2	17. 4	18. 2	19. 3	20. 1
21. 3	22. 2	23. 3	24.3	25. 1	26. 2	27. 2	28. 2	29. 3	30. 1
31. 2	32. 2	33. 4	34.2	35. 4	36. 3	37. 1	38. 3	39. 3	40. 1

41. 2	42. 1	43. 2	44.2	45. 1	46. 3	47. 4	48. 4	49. 3	50. 3
51. 3	52. 2	53. 1	54.3	55. 2	56. 2	57. 1	58. 3	59. 3	60. 3
61. 4	62. 3	63. 3	64.2	65. 1	66. 2	67. 4	68. 2	69. 4	70. 3
71. 1	72. 3	73. 3	74.4	75.3	76)3	77.2	78.3		

AIEEE PROBLEMS

1. $\underset{n\to\infty}{Lt}\dfrac{1+2^4+3^4+...+n^9}{n^5}-\underset{n\to\infty}{Lt}\dfrac{1+2^3+3^3+...+n^3}{n^5}$ is [2003]
   1) zero 2) 1/4 3) 1/5 4) 1/30

2. $\underset{x\to\infty}{Lt}\sum_{r=1}^{n}\dfrac{1}{n}e^{r/n}$ is [2004]
   1) e 2) $e + 1$ 3) $1 - e$ 4) $e - 1$

3. $\underset{n\to\infty}{Lt}\left(\dfrac{1}{n^2}\sec^2\dfrac{1}{n^2}+\dfrac{2}{n^2}\sec^2\dfrac{4}{n^2}+...+\dfrac{1}{n^2}\sec^2 1\right)=$ [2005]
   1) $\frac{1}{2}\sec 1$ 2) $\frac{1}{2}\operatorname{cosec} 1$ 3) tan 1 4) $\frac{1}{2}\tan 1$

4. The area enclosed between the curve $y = \log_e (x + e)$ and the coordinate axes is [2005]
   1) 1 2) 2 3) 3 4) 4

5. The area enclosed between the curves $y^2 = x$ and $y = |x|$ is [2007]
   1) 2/3 2) 1 3) 1/6 4) 1/3

6. The area of the region bounded by the curves $y = |x – 2|$, $x = 1$, $x = 3$ and the x-axis is [2004]
   1) 1 2) 4 3) 3 4) 2

7. The area of the region bounded by the curves $y = |x – 1|$ and $y = 3 – | x |$ is [2003]
   1) 2 2) 3 3) 4 4) 1

8. The parabolas $y^2 = 4x$ and $x^2 = 4y$ divide the square region bounded by the lines $x = 4$, $y = 4$, and the coordinates axes. If S_1, S_2, S_3 are respectively the areas of these parts numbered from top to bottom; then $S_1 : S_2 : S_3$ is [2005]
   1) 1:2:1 2) 1:2:3 3) 2:1:2 4) 1:1:1

KEY

1) 3	2) 4	3) 4	4) 1	5) 4	6) 1	7) 3	8) 4

18. DIFFERENTIAL EQUATIONS

1. If $y=ae^{\alpha x}+be^{\beta x}$, then D.E.$=y_2-(\alpha+\beta)y_1+\alpha\beta y=0$.

2. If $y=A_1x^m+A_2x^n$, then D.E.$=x^2y_2-(m+n-1)xy_1+mny=0$.

3. If $y=e^{\alpha x}(A_1\cos\beta x+A_2\sin\beta x)$, then D.E.$=y_2-2\alpha y_1+(\alpha^2+\beta^2)y=0$.

4. If $y=e^{\alpha x}(Ax^2+Bx+C)$, then D.E.$=y_3-3\alpha y_2+3\alpha^2y_1-\alpha^3y=0$.

5. $\int(xdy+ydx)=xy+c$

6. $\int(ydx-xdy)/x^2=x/y+c$

7. $\int(xdy-ydx)/x^2=y/x+c$

8. $\int e^{f(x)}.f'(x)dx= e^{f(x)}+c$

9. Homogeneous equation:A D.E. $dy/dx=f(x,y)/g(x,y)$ is said to be a homogeneous D.E. if f and g are homogeneous function of same degree in x and y.
   put $y=vx \rightarrow dy/dx=v+x(dv/dx)$

10. Non-Homogeneous equation: An equation of the form $dy/dx=(ax+by+c)/(a'x+b'y+c')$ is called Non-Homogeneous D.E. of first order
    put $ax+by=v$ then $a+b(dy/dx)=dv/dx$
    $dy/dx=1/b[(dv/dx)-a]$

11. Linear D.E.
    $dy/dx+P(x)y=Q(x)$
    $y(I.F.)=\int Q(I.F)dx+c$ where $I.F=e^{\int pdx}$

12. $dx/dy+P(y)x=Q(y)$
    $x(I.F)=\int Q(I.F)dy+c$ where $I.F=e^{\int pdy}$

Exercise-A

I. The order and degree of D.E are

1. $d^2y/dx^2=(dy/dx)+y$
   1)2,1 2)1,1 3)1,2 4)2,2

2. $d^2y/dx^2 = [1+(dy/dx)^2]^{3/2}$=_____
   1)1,1 2)2,2 3)2,3 4)3,2

3. $7(dy/dx)^2 = 1+(d^2y/dx^2)^2$=_____
   1)1,1 2)1,2 3)2,1 4)2,2

4. $y= x (dy/dx) + m \sqrt{1+\left(\frac{dy}{dx}\right)^2} =$
   1)1,1 2)1,2 3)2,1 4)2,2

5. $x^3 (d^3y/dx^3) + cx^2 (d^2y/dx^2)+5x(dy/dx)+7y=0$=_____
   1)1,3 2)2,3 3)3,1 4)1,4

II. Form the D.E equation by eliminating the arbitrary constants shown in bracket.

6. $y^2=4ax$. (a)
   1)$dy/dx=y/2x$ 2)$dy/dx=2x$ 3)$dy/dx=2y$ 4)$dy/dx=2y/x$

7. $y=mx+(a/m)$ (m)
   1)$xy_1^2-yy_1=0$ 2)$xy_1^2-yy_1+a=0$ 3)$xy_1+a=0$ 4)$x+a=0$

8. $y=ae^{2x}+be^{3x}$ (a,b)
   1)$y_2-5y_1=0$ 2)$y_2-5y_1+6y=0$ 3)$y_2+6y=0$ 4)$y_2+6y=0$

9. $y=ae^{3x}+be^{5x}$ (a,b)
   1)$y_2-8y_1=0$ 2)$y_2+15y=0$ 3)$8y_1+15y=0$ 4)$y_2-8y_1+15y=0$

10. $y=ae^{-2x}+be^{7x}$ (a,b)
    1)$y_2-5y_1-14y=0$ 2) $y_2-5y_1=0$ 3) $y_2-14y=0$ 4) $5y_1-14y=0$

11. $y=ae^{mx}+be^{-mx}$ (a,b)
    1)$y_2=0$ 2)$y_2-m^2y=0$ 3) $y_2+m^2y=0$ 4) $y_1-m^2y=0$

12. $xy=ae^{x}+be^{-x}+x^2$ (a,b)
    1)$xy_2+2y_1=xy-x^2+2$ 2) $xy_2=xy_1-x^2+2$ 3) $xy_2+2y_1=x^2+2$ 4) $xy_2+2y_1=xy-x^2$

13. $y=ax^2+bx$ (a,b)

1)$x^2y_2+2y=0$ 2) $x^2y_2-2xy_1+2y=0$ 3) $x^2y_2+2y_1=0$ 4) $x^2y_2+2x+2y=0$

14. $ax^2+by^2=1$ (a,b)

1)$xy_1^2-xyy_2-yy_1= 0$ 2) $xy_1^2+xyy_2-yy_1= 0$

3)$xy_1^2+xyy_2+yy_1= 0$ 4))$2xy_1^2+xyy_2+yy_1= 0$

15. $y=a\cos(2x+b)$ (a,b)

1)$y_2=0$ 2)$y_2+4y=0$ 3)$y_2+4y_1=0$ 4)$4y_2+y=0$

16. $y=e^x(a\cos 2x+b\sin 2x)$ (a,b)

1)$y^2-2y_1=0$ 2)$y_2-2y_1=0$ 3)$y^2+5y=0$ 4)$y^2-2y_1+5y=0$

17. $y=e^{3x}(a\cos x+ b\sin x)$ (a,b)

1)$y_2-6y_1+10y=0$ 2) $y_2+6y_1+10y=0$ 3) $y_2-6y_1-10y=0$ 4) $y_2-6y_1=0$

18. $y= A\sin 2x+ B\cos 2x$ (A,B)

1) $y_2=0$ 2)$y_2+4y=0$ 3)$y_2+4y_1=0$ 4)$4y_2+y=0$

19. $y=e^{2x}(Ax^2+ Bx+C)$ (A,B,C)

1)$y_3-6y_2+12y_1-8y=0$ 2) $y_3-6y_2+12y_1+8y=0$

3) $y_3-6y_2-12y_1-8y=0$ 4) $y_3+6y_2+12y_1-8y=0$

20. $y=e^x(Ax^2+Bx+C)$

1) $y_3-3y_2+3y_1-y=0$ 2) $y_3-6y_2+12y_1+8y=0$

3) $y_3-3y_2-12y_1-y=0$ 4) $y_3+6y_2+3y_1-8y=0$

III.

21. The D.E of family of lines through origin is ____

1)$y=xy_1$ 2) $x=yy_1$ 3) $x-yy_1=y-xy_1$ 4) $x-y=y_1$

22. The D.E of family of circles through origin and having their centres on x-axis is

1) $y_1=(y^2+x^2)/2xy$ 2) $y_1=(y^2-x^2)/2xy$ 3) $y_1=(y^2-x^2)/xy$ 4)$y_1=(y^2-x^2)/2xy^2$

23. The D.E. of family of parabola having vertices at origin and foci on y-axis is ____

1)$y_1=2y/x$ 2) $y_1=y/2x$ 3) $y_1=y/x$ 4) $y_1=2y/x^2$

IV.VARIABLE SEPERABLE

24. The solution of D.E. $xdy/dx = 2y$ is

1)$y=cx^2$ 2) $y^2=cx^3$ 3) $y=cx^3$ 4) $x=cy^2$

25. The solution of D.E. $ydx+xdy=0$ is
1)$xy=c$ 2)$x+y=c$ 3)$x-y=c$ 4)$x/y=c$

26. $dy/dx+ (1+y^2)/(1+x^2)=0$
1)$y+x=c$ 2)$y+x=c(1-yx)$ 3)$y-x=c(1+yx)$ 4)$y=cx$

27. $dy/dx+ \sqrt{\frac{1-y^2}{1-x^2}}=0$
1)$\sin^{-1}x+\sin^{-1}y=c$ 2) $\cos^{-1}x+\sin^{-1}y=c$
3) $\sin^{-1}x+\cos^{-1}y=c$ 4) $\cos^{-1}x+\cos^{-1}y=c$

28. $dy/dx= 5^{x-y}$
1)$5^y-x=c$ 2)$5^x-y=c$ 3)$5^x-5^y=c$ 4)$5^y-5^x=c$

29. $dy/dx=1+x^2+y^2+x^2y^2$
1)$\tan^{-1}y=c$ 2) $\tan^{-1}y=x+x^3/3+c$ 3) $\tan^{-1}y=x+c$ 4) $\tan^{-1}y=x^3/3+c$

30. $y\,dx-xdy+ 3x^2y^2e^{x3}\,dx=0$
1)$x/y+e^{x3}+c$ 2)$x/y+c=o$ 3)e^x+x+c 4)$x/y+xy+c$

31. $\sqrt{1-x^2}\sin^{-1}xdy+ydx=0$
1)$\sin^{-1}x=c$ 2) $y\sin^{-1}x=c$ 3) $x\sin^{-1}x=c$ 4) $\sin^{-1}x+xy=c$

32. $dy/dx= (x+y)^2$
1)$z=\tan(x+c)$ 2) $z=\tan(y+c)$ 3) $z=\tan^{-1}(x+c)$ 4)2 $z=\tan(x+c)$

33. If the population x in any year t is such that the rate of increase is proportional to the population then
1)$x=ct$ 2) $x=ce^{kt}$ 3) $x=ce^{-kt}$ 4) $x=ck$

34. Let p be the petrol left at time t. If the rate of evaporation of petrol is proportional to the amount remaining then
1)$P= ce^{kt}$ 2) $P=ce^{-kt}$ 3) $p=ct$ 4) $Pt=c$

35. The equation of curve passing through $(\pi/6,0)$ and has a solution
$(e^y+1)\cos x dx+e^y\sin x dy=0$ is
1)$\sin x=1+e^y$ 2)$\sin x(1+e^y)=0$ 3)$(1+e^y)\sin x=1$ 4)$\sin x=e^y\cos x$

V.HOMOGENEOUS EQUATION

36. $dy/dx=(x-y)/(x+y)$
1)$x^2-2xy-y^2=c$ 2) $x^2-2xy+y^2=c$ 3) $x^2+2xy-y^2=c$ 4) $-x^2-2xy-y^2=c$

37. The solution of $dy/dx=(x^2+y^2)/xy$ is

1)$cx=e^{2y}$ 2)$cx=e^{2x}$ 3)$cx=\frac{e^{y^2}}{2x^2}$ 4)$cx=e^{y}$

38. The solution of $dy/dx=\frac{\sqrt{x^2+y^2}+y}{x}$

1)$\sinh^{-1}y/x=\log cx$ 2) $\sin^{-1}y/x=\log cx$ 3) $\sinh^{-1}y/x=\log cx$ 4) $\sinh^{-1}y/x=cx$

VI. NON-HOMOGENOUS

39. $(x+2y-3)dy/dx=2x-y+1$

1)$xy+3y=c$ 2)$xy+y^2-3y-x^2-x=c$ 3) $xy+y^2-3y-x^2=c$ 4) $y^2-3y-x^2-x=c$

40. $(x+y-1)dy=(x-y+2)dx$

1)$y^2-x^2+2xy-2y-4x=c$ 2) $x^2+2xy-2y-4x=c$

3) $y^2-x^2+2xy-2y=c$ 4) $y^2-x^2+2xy-2y+4x=c$

VII. LINEAR D.E.

41. Find the integration factor of $(dy/dx)+y=e^x$.

1)e^x 2)e^y 3)1 4)0

42. I.F. of $x\log x(dy/dx)+y=1$.

1)$\log y$ 2)$\log x$ 3)$1/\log x$ 4)$1/\log y$

43. I.F. of $x(x-1)dy/dx+y=x-1$.

1)$(x-1)/x$ 2)$(x+1)/x$ 3)$x+1$ 4)$x-1$

44. Solution of $(dy/dx)+3y/x=1/x^2$ given that $y=2$, when $x=1$ is _____

1)$y=ce^x$ 2)$y=e^{-x}+ce^x$ 3)$y=e^{-x}$ 4)$yx^3=x^2/2+3/2$

45. $(dy/dx)-y=-2e^{-x}$

1)$y=ce^x$ 2)$y=e^{-x}+ce^x$ 3)$y=e^{-x}$ 4)$y=ce^{-x}$

VIII.

46. $(dx/dy)-\cot y.\ x=\sin y$

1)$x\ \mathrm{cosec}\,y=c$ 2)$x\ \mathrm{cosec}\,x=x+c$ 3)$x\ \mathrm{cosec}\,y=y+c$ 4)$\mathrm{cosec}\,y=cx$

47. $dx/dy=x+3y+2$

1)$(x+3y+5)e^{-y}=c$ 2) $(x+3y)e^{-y}=ce^{y}$ 3) $(x-3y+5)e^{-y}=ce^{y}$ 4) $(x-3y-5)e^{-y}=ce^{y}$

48. Match the following.

Differential equation	Solution
I.$(xy^2+x)dx+(yx^2+y)dy=0$	a)$x^2-1=c(1+y^2)$
II.$(x^2y^2+y^2)dx+(x^2-x^2y^2)dy=0$	b)$(x^2+1)(y^2+1)=c$
III.$(x+xy^2)dx+(y-x^2y)dy=0$	c)$x+1/x+y+1/y+c=0$

1)a,b,c 2)b,c,a 3)c,a,b 4)c,b,a

49. A: The order of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3+2\left(\frac{dy}{dx}\right)^4+y=0$ is 2.

R: The order of the highest derivative involved in an ordinary differential equation is equal to the order of the differential equation.
1) Both A and R are true and R is the correct explanation of A
2)Both A and R are true but R is not correct explanation of A
3) A is true but R is false 4) A is false but R is true

50. **<u>Bernoulli's Equation</u>:**

The solution of $\left(1-x^2\right)\frac{dy}{dx}+xy=xy^2$ is

1) $\sqrt{x^2-1}=y\sqrt{x^2+1}+cy$ 2) $\sqrt{x^2-1}=y\sqrt{x^2-1}+cy$
3) $\sqrt{x^2+1}=y\sqrt{x^2+1}+cy$ 4) $\sqrt{x^2+1}=\sqrt{x^2-1}+cy$

PREVIOUS EAMCET PAPERS PROBLEMS

51. Solution of the differential equation $dy/dx=(1+y^2)(1+x^2)^{-1}$ is [1997]
1)y-x=c(1+xy) 2)y+x=c(1+xy) 3)y+x=c(1-xy) 4)y-x=c(1-xy)

52. The general solution of the differential equation $(dy/dx)-2xy/(1+x^2) = 0$ is [1998]
1)$y=A(1+x^2)$ 2)$y=A\sqrt{(1+x^2)}$ 3)$y=A/(1+x^2)$ 4)$y=A/\sqrt{(1+x^2)}$

53. The solution of $2xy(dy/dx)=1+y^2$ is [1999]
1)$1+y^2=cx$ 2)$1-y^2=cx$ 3)$1+x^2=cy$ 4)$1-x^2=cy$

54. The order of the differential equation $(dy/dx)^3+(dy/dx)^2+y^4 = 0$ is [1999]
1)4 2)3 3)1 4)2

55. The equation of the curve through the origin and satisfying the differential equation $dy/dx = (x-y)^2$ is [2000]
1)$e^{2x}(1-x+y)=1+x-y$ 2)$e^{2x}(1+x-y)=1-x+y$
3)$e^{2x}(1-x+y)=-(1+x+y)$ 4)$e^{2x}(1+x+y)=1-x+y$

56. If c is a parameter, then the differential equation whose solution is $y=c^2+(c/x)$ is [2000]

1) $y=x^4(dy/dx)-x(dy/dx)^2$ 2) $y=x^4(dy/dx)^2+x(dy/dx)$

3) $y=x^4(dy/dx)^2-x(dy/dx)$ 4) $y=x^4(d^2y/dx^2)-x(dy/dx)$

57. The solution of $dy/dx+y=e^x$ is [2001]

1) $2y=e^{2x}+c$ 2) $2ye^x = e^x+c$ 3) $2ye^x =e^{2x}+c$ 4) $2ye^{2x}=2e^{2x}+c$

58 The solution of $x^2+y^2dy/dx=4$ is [2001]

1) $x^2+y^2=12x+c$ 2) $x^2+y^2=3x+c$ 3) $x^3+y^3=3x+c$ 4) $x^3+y^3=12x+c$

59. The family of curves in which the subtangent at any point to any curve is double the abscissa is [2001]

1) $x=cy^2$ 2) $y=cx^2$ 3) $x^2=cy^2$ 4) $y=cx$

60. The solution of $xdx+ydy=x^2ydy-xy^2dx$ is [2001]

1) $x^2-1=c(1+y^2)$ 2) $x^2+1=c(1-y^2)$ 3) $x^2-1=c(1+y^2)$ 4) $x^3+1=c(1-y^3)$

61. The solution of $dy/dx=(y/x)^{1/3}$ is [2002]

1) $x^{2/3}+y^{2/3}=c$ 2) $y^{2/3}-x^{2/3}=c$ 3) $x^{1/3}+y^{1/3}=c$ 4) $y^{1/3}-x^{1/3}=c$

62. $y+x^2=dy/dx$ has the solution [2002]

1) $y+x^2+2x+2=ce^x$ 2) $y+x+2x^2+2=ce^x$ 3) $y+x+x^2+2=ce^{2x}$ 4) $y^2+x+x^2+2=ce^{2x}$

63. The solution of $dy/dx+y/3=1$ is [2002]

1) $y=3+ce^{x/3}$ 2) $y=3+ce^{-x/3}$ 3) $3y=c+e^{x/3}$ 4) $3y=c+e^{-x/3}$

64. Order of the differential equation of the family of all concentric circles centered at (h,k) is [2002]

1)1 2)2 3)3 4)4

65. The general solution of $y^2dx+(x^2-xy+y^2)dy=0$ is [2003]

1) $\tan^{-1}(x/y)+\log y+c=0$ 2) $2\tan^{-1}(x/y)+\log x+c=0$

3) $\log[y+\sqrt{(x^2+y^2)}]+\log y+c=0$ 4) $\sinh^{-1}(x/y)+\log y+c=0$

66. Solution of $dy/dx=(x\log x^2+x)/(\sin y+y\cos y)$ is [2003]

1) $y\sin y=x^2\log x+c$ 2) $y\sin y=x^2+c$ 3) $y\sin y=x^2+\log x+c$ 4) $y\sin y=x\log x+c$

67. The differential equation of the family of parabolas with focus at origin and the x-axis as axis is

1) $y(dy/dx)^2+4x(dy/dx)=4y$ 2) $-y(dy/dx)^2=2x(dy/dx)-y$

3) $y(dy/dx)^2+y=2xy(dy/dx)$ 4) $y(dy/dx)^2+2xy(dy/dx)+y=0$ [2003]

68. $y=Ae^{x}+Be^{2x}+Ce^{3x}$ satisfies the differential equation [2004]

1)$y'''-6y''+11y'-6y=0$ 2) $y'''+6y''+11y'+6y=0$

3)$y'''+6y''-11y'+6y=0$ 4)$y'''-6y''-11y'+6y=0$

69. Observe the following statements: [2004]

A: Integrating factor of $dy/dx + y = x^2$ is e^{x}

R: Integrating factor of $dy/dx + P(x)y = Q(x)$ is $e^{\int p(x)dx}$

then the true statement among the following is

1)A istrue, R is false 2) A is false, R is true

3)A is true, R is true,R $\Rightarrow$A 4) A is false, R is false

70. Integrating factor of $(x+2y^3)dy/dx = y^2$ is [2004]

1) $e^{(1/y)}$ 2) $e^{-(1/y)}$ 3) y 4 –1/y

71. $dx+dy=(x+y)(dx-dy) \Rightarrow \log(x+y)=$ [2005]

1)x+y+c 2)x+2y+c 3)x-y+c 4)2x+y+C

72. $x^2y - x^3dy/dx=y^4\cos x \Rightarrow x^3y =$___ [2005]

1)sinx+c 2)2sinx+c 3)3sinx+c 4)3cosx+c

73. Observe the following statements: [2005]

I.$dy+2xydx = 2e^{-x^2}\ dx \Rightarrow ye^{x^2} = 2x+c$

II.$ye^{x^2} + 2x = c \Rightarrow dx= |2e^{-x^2} - 2xy|dy$

Which of the following is a correct statemtnt?

1)Both I and II are true 2)Neither I nor II is true

3)I is true,II is false 4)I is false,II is true

74. $dy/dx= \frac{y+x\tan(y/x)}{x} \Rightarrow \sin(y/x)$ [2005]

1)cx^2 2)cx 3)cx^3 4)cx^4

75. . The solution of $(x^2+y^2)dx =2xy\ dy$ is: [2006]

1)$c(x^2 –y^2)=x$ 2)$c(x^2 +y^2)=x$ 3)$c(x^2 –y^2)=y$ 4)$c(x^2 +y^2)=y$

76. The solution of $(1+x^2)dy/dx+2xy-4x^2=0$ is : [2006]

1)$3x(1+y^2)=4y^3+c$ 2)$3y(1+x^2)=4x^3+c$

3)$3x(1-y^2)=4y^3+c$ 4)$3y(1+y^2) =4x^3+c$

77. The solution of $dx/dy + x/y = x^2$ is : [2006]

1)1/y=cx-xlogx 2)1/x=cy-ylogy

3)1/x=cx+xlogy 4)1/y=cx-ylogx

78. The differential equation obtained by eliminating the arbitrary constants *a* and *b* *from* $xy =ae^{x} + be^{-x}$ is [2007]

1) $x\frac{d^2y}{dx^2}+2\frac{dy}{dx}-xy=0$ 2) $\frac{d^2y}{dx^2}+2y\frac{dy}{dx}-xy=0$

3) $x\frac{d^2y}{dx^2}+2\frac{dy}{dx}-y=0$ 4) $\frac{d^2y}{dx^2}+\frac{dy}{dx}-xy=0$

79. The solution of $\frac{dy}{dx}+1=e^{x+y}$ is [2007]

1) $e^{-(x+y)}+x+C=0$ 2) $e^{-(x+y)}-x+C=0$
3) $e^{(x+y)}+x+C=0$ 4) $e^{(x+y)}-x+C=0$

80. The solution of $(x+y+1)\frac{dy}{dx}=1$ is [2007]

1) $y=(x+2)+ce^x$ 2) $y=-(x+2)+ce^x$ 3) $x=-(y+2)+ce^y$ 4) $x=(y+2)^2+ce^y$

81. The solution of $\frac{dy}{dx}=\frac{y^2}{xy-x^2}$ is [2007]

1) $e^{y/x}=kx$ 2) $e^{y/x}=ky$ 3) $e^{-y/x}=kx$ 4) $e^{-y/x}=ky$

82. The solution of $\frac{dy}{dx}=\frac{xy+y}{xy+x}$ is [2008]

1) x+y=log(cy/x) 2) x+y=log(cyx)
3) x-y=log(cx/y) 4) y-x=log(cx/y)

83. The solution of $\frac{dy}{dx}=\frac{x-2y+1}{2x-4y}$ is [2008]

1) $(x-2y)^2+2x=c$ 2) $(x-2y)^2+x=c$
3) $(x-2y)+2x^2=c$ 4) $(x-2y)+x^2=c$

84. $\frac{dy}{dx}-y\tan x=e^x\sec x$ is [2008]

1) $y=e^x\cos x+c$ 2) $y\cos x=e^x+c$
3) $y=e^x\sin x+c$ 4) $y\sin x=e^x+c$

85. The solution of $xy^2dy-(x^3+y^3)dx=0$ is [2008]

1) $y^3=3x^3+c$ 2) $y^3=3x^3\log(cx)$
3) $y^3=3x^3+\log(cx)$ 4) $y^3+3x^3=\log(cx)$

86. The solution of the differential equation $\frac{dy}{dx}=\sin(x+y)\tan(x+y)-1$ is [2009]

1) cosec(x + y) + tan(x + y) = x + c 2) x + cosec (x + y) = c
3) x + tan (x + y) = c 4) x + sec (x + y) = c

87. The differential equation of the family $y = ae^x + bx\,e^x + cx^2\,e^x$ of curves, where a, b, c are arbitrary constants, is : [2009]

1) $y''' + 3y'' + 3y' + y = 0$
2) $y''' + 3y'' - 3y' - y = 0$
3) $y''' - 3y'' - 3y' + y = 0$
4) $y''' - 3y'' + 3y' - y = 0$

88. The solution of $\tan y \dfrac{dy}{dx} = \sin(x+y) + \sin(x-y)$ is : [2010]

1) secy = 2cosx + c
2) sexy = -2cosx + c
3) tany = -2cosx + c
4) $\sec^2 y$ = -2cosx + c

89. A family of curves has the differential equation $xy\dfrac{dy}{dx} = 2y^2 - x^2$. Then the family of curves is: [2010]

1) $y^2 = cx^2 + x^3$
2) $y^2 = cx^4 + x^3$
2) 3) $y^2 = x + cx^4$
4) $y^2 = x^2 + cx^4$

90. The solution of the differential equation $\dfrac{dy}{dx} = \dfrac{y}{x} + \dfrac{\phi(y/x)}{\phi'(y/x)}$ is [2011]

1) $x\phi\left(\dfrac{y}{x}\right) = k$
2) $\phi\left(\dfrac{y}{x}\right) = kx$
3) $y\phi\left(\dfrac{y}{x}\right) = k$
4) $\phi\left(\dfrac{y}{x}\right) = ky$

91. If y = y(x) is the solution of the differential equation $\left(\dfrac{2+\sin x}{y+1}\right)\dfrac{dy}{dx} + \cos x = 0$ with y(0) = 1, then $y\left(\dfrac{\pi}{2}\right) =$ [2011]

1) $\dfrac{1}{3}$
2) $\dfrac{2}{3}$
3) 1
4) $\dfrac{4}{3}$

92. $\dfrac{dy}{dx} + 2x\tan(x-y) = 1 \Rightarrow \sin(x-y) =$ [2012]

1) Ae^{-x^2}
2) Ae^{2x}
3) Ae^{x^2}
4) Ae^{-2x}

93. An integrating factor of the differential equation $(1-x^2)\dfrac{dy}{dx} + xy = \dfrac{x^4}{(1+x^5)}\left(\sqrt{1-x^2}\right)^3$ is [2012]

1) $\sqrt{1-x^2}$
2) $\dfrac{x}{\sqrt{1-x^2}}$
3) $\dfrac{x^2}{\sqrt{1-x^2}}$
4) $\dfrac{1}{\sqrt{1-x^2}}$

94. An integrating factor of the equation $(1 + y + x^2y)dx + (x + x^3)\,dy = 0$ is [2013]

1) e^x 2) x^2 3) $\frac{1}{x}$ 4) x

95. The solution of the differential equation $\frac{dy}{dx} - 2y\tan 2x = e^x \sec 2x$ is: [2013]

1) $y \sin 2x = e^x + c$ 2) $y \cos x\, 2x = e^x + c$
3) $y = e^x \cos 2x + c$ 4) $y \cos x\, 2x + e^x = c$

96. The differential equation of the family of parabolas with vertex at (0, -1) & having axis along the y – axis is (2014)

1) $xy' + y + 1 = 0$ 2) $xy' - 2y - 2 = 0$
3) $xy' - y - 1 = 0$ 4) $yy' + 2xy + 1 = 0$

97. The solution of $x\frac{dy}{dx} = y + xe^{y/x}$ with y(1) = 0 is (2014)

1) $e^{-y/x} = \log x$ 2) $e^{-y/x} + 2\log x = 1$ 3) $e^{-y/x} + \log x = 1$ 4) $e^{y/x} + \log x = 1$

98. The solution of $\cos y + (x\sin y - 1)\frac{dy}{dx} = 0$ is (2014)

1) tany – secy = cx 2) tany + secy = cx
3) xsecy + tany = c 4) xsecy = yany + c

99. Match the differential equation in List – I to their Integrating factors in List – II (2015)

List – I	List – II
i) $(x^2+1)\frac{dy}{dx} + x^2 y = 3x^2$	a) x^3
ii) $x^2\frac{dy}{dx} + 3xy = x^6$	b) $(x^3 + 1)^2$
iii) $(x^3+1)^2\frac{dy}{dx} + 6x^2(x^3+1)y = x^2$	c) $(x^2 + 1)^2$
iv) $(x^2+1)\frac{dy}{dx} + 4xy = in\, x$	d) $x^2 + 1$
	e) $(x^3 + 1)^{1/3}$
	f) $(x^3 + 1)^{1/2}$

The correct match is

	(i)	(ii)	(iii)	(iv)		(i)	(ii)	(iii)	(iv)
1)	(d)	(a)	(b)	(c)	2)	(e)	(a)	(b)	(c)
3)	(e)	(b)	(c)	(f)	4)	(e)	(a)	(c)	(d)

100. The solution of the differential equation $xy' = 2xe^{-y/x} + y$ is (2015)

1) $e^{y/x} + In|cx| = 0$ 2) $e^{-y/x} = In|cx|$ 3) $e^{y/x} = In|cx|$ 4) $e^{y/x} = 2In|cx|$

101. The differential equation of the family of curves $y = ax + \frac{1}{a}$, where $a \neq 0$ is an arbitrary constant, has the degree (2015)

1) 4 2) 3 3) 1 4) 2

102. The solution of $\frac{dy}{dx} + \frac{1}{x} = \frac{e^y}{x^2}$ is (2015 A.P)

1) $2x = (1 + cx^2)\, e^y$ 2) $x = (1 + cx^2)e^y$
3) $2x^2 = (1 + cx^3)e^{-y}$ 4) $x^2 = (1 + cx^2)e^{-y}$

103. The differential equation $\frac{dy}{dx} = \frac{1}{ax + by + c}$ where a, b, c are all non zero real numbers, is (2015 A.P)

1) Linear in y 2) Linear in x
3) Linear in both x & y 4) Homogeneous equation

104. Let $p \in \square$, then the differential equationof the faily of curves $y = (\alpha + \beta)e^{px}, where\, \alpha, \beta$ are arbitrary constants, is (2016)

1) $y'' + 4py' + p^2 y = 0$ 2) $y'' - 2py' + p^2 y = 0$
3) $y'' + 2py' - p^2 y = 0$ 4) $y'' + 2py' + p^2 y = 0$

105. The solution of the differential equations $3xy' - 3y + \left(x^2 - y^2\right)^{1/2} = 0$, satisfying the condition $y(1) = 1$ is (2016)

1) $3\cos^{-1}\left(\frac{y}{x}\right) = In|x|$ 2) $3\cos\left(\frac{y}{x}\right) = In|x|$
3) $3\cos^{-1}\left(\frac{y}{x}\right) = 2In|x|$ 4) $3\sin^{-1}\left(\frac{y}{x}\right) = In|x|$

106. The solution of the differential equation $y' = \frac{1}{e^{-y} - x}$, is (2016)

1) $x = e^{-y}(y + c)$ 2) $y + e^{-y} = x + c$ 3) $x = e^{y}(y + c)$ 4) $x + y = e^{-y} + c$

107. The solution of the differential equation $\left(1 + y^2\right) + \left(x - e^{\tan^{-1} y}\right)\frac{dy}{dx} = 0$ is(2016AP)

1) $xe^{\tan^{-1} y} = \tan^{-1} y + c$ 2) $xe^{2\tan^{-1} y} = e^{-\tan^{-1} y} + c$
3) $2xe^{\tan^{-1} y} = e^{2\tan^{-1} y} + c$ 4) $x^2 e^{\tan^{-1} y} = 4e^{2\tan^{-1} y} + c$

108. The solution of the differential equation $(2x - 4y + 3)\frac{dy}{dx} + (x - 2y + 1) = 0$ is (2016AP)

1) $\log\left((2x - 4y) + 3\right) = x - 2y + c$ 2) $\log\left[2(2x - 4y) + 3\right] = 2(x - 2y) + c$

3) $\log\left[2(x-2y)+5\right]=2(x+y)+c$ 4) $\log\left[4(x-2y)+5\right]=4(x+2y)+c$

109. The solution of $\frac{dy}{dx}=\frac{x+y}{x-y}$ is

1) $Tan^{-1}\left(\frac{x}{y}\right)=\log\sqrt{x^2+y^2}+C$ 2) $Tan^{-1}\left(\frac{y}{x}\right)=\log\sqrt{x^2-y^2}+C$

3) $Sin^{-1}\left(\frac{y}{x}\right)=\log\sqrt{x^2+y^2}+C$ 4) $Cos^{-1}\left(\frac{y}{x}\right)=\log\sqrt{x^2-y^2}+C$

110. If $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, then $\frac{d^2y}{dx^2}=$ (2017)

1) $\frac{-b^4}{a^2y^3}$ 2) $\frac{b^2}{ay^2}$ 3) $\frac{-b^3}{a^2y^3}$ 4) $\frac{b^3}{a^2y^2}$

111. The solution of $(y-3x^2)dx+xdy=0$ is (2017)

1) $y(x)=\sin x+\frac{1}{x^2}+C$ 2) $y(x)=\cos x+\frac{1}{x^2}+C$

3) $y(x)=x^2+\frac{C}{x}$ 4) $y(x)=\sqrt{x}+\frac{C}{x}$

112. The differential equation of the simple harmonic motion given by $a=A\cos(nt+\alpha)$ is (2017)

1) $\frac{d^2x}{dt^2}-n^2x=0$ 2) $\frac{d^2x}{dt^2}+n^2x=0$

3) $\frac{dx}{dt}-\frac{d^2x}{dt^2}=0$ 4) $\frac{d^2x}{dt^2}-\frac{dx}{dt}+nx=0$

KEYS

1. 1	2. 2	3. 4	4. 2	5. 3	6. 1	7. 2	8. 2	9. 4	10. 1
11. 2	12. 1	13. 2	14. 2	15. 2	16. 4	17. 1	18. 2	19. 1	20. 1
21. 1	22. 2	23. 1	24. 1	25. 1	26. 2	27. 1	28. 4	29. 2	30. 1
31. 2	32. 1	33. 2	34. 1	35. 3	36. 1	37. 3	38. 1	39. 2	40. 1
41. 1	42. 1	43. 4	44. 2	45. 3	46. 1	47. 2	48. 1	49. 2	50. 2
51. 1	52.	53. 1	54. 3	55. 1	56. 3	57. 3	58. 1	59. 1	60. 3
61. 2	62. 1	63. 2	64. 1	65. 1	66. 1	67. 2	68. 1	69. 3	70. 1
71. 3	72. 1	73. 3	74. 1	75. 1	76. 2	77. 1	78. 1	79. 1	80. 3
81. 2	82. 4	83. 1	84. 2	85. 2	86. 2	87. 4	88. 2	89. 4	90. 2
91. 1	92. 3	93. 4	94. 4	95. 2	96. 2	97. 3	98. 4	99. 2	100. 4
101. 2	102. 1	103. 2	104. 2	105. 1	106. 1	107. 3	108. 4	109. 1	110. 1
111. 3	112. 2	113.	114.	115.	116.	117.	118.	119.	120.

Exercise-B

1. Order & degree of differential equation $\frac{d^2y}{dx^2}=\left[y+\left(\frac{dy}{dx}\right)^2\right]^{1/4}$ are:

   1) 4 & 2 2) 1 & 2 3) 1 & 4 4) 2 & 4

2. If m & n are the order & degree of the differential equation

   $\left(\frac{d^2y}{dx^2}\right)^5+\frac{\left(\frac{d^2y}{dx^2}\right)^3}{\frac{d^3y}{dx^3}}+\frac{d^3y}{dx^3}=x^2-1$ then

   1) m=3, n=3 2) m=3, n=2 3) m=3, n=5 4) m=3, n=1

3. Which of the following is the integrating factor of $x\log x\frac{dy}{dx}+y=2\log x$

   1) x 2) e^x 3) logx 4) log(logx)

4. What is the integrating factor of $\frac{dy}{dx}+y\sec x=\tan x$

   1) secx+tanx 2) log(secx+tanx) 3) e^{secx} 4) secx

5. Solution of the differential equation $\frac{dy}{dx}+\frac{3x+2y-5}{2x+3y-5}=0$ is

   1) $3x^2+4xy+3y^2-10x-10y=c$ 2) $x^2+4xy-y^2-4x+16y=c$
   3) $(x+2y)^2+3y=c$ 4) None of these

6. The differential equation representing the family of the curve $y^2=2c(x+\sqrt{c})$, where c is a positive perimeter, is of:
   1) Order 1, degree3 2) Order 2, degree 2
   3) Degree 3, order 3 4) Degree 4, order 4

7. The solution of the differential equation $\frac{dy}{dx}=\left(x^2+xy+y^2\right)/x^2$ is:

   1) $\tan^{-1}\frac{x}{y}=\log y+c$ 2) $\tan^{-1}\frac{y}{x}=\log x+c$

   3) $\tan^{-1}\frac{x}{y}=\log x+c$ 4) $\tan^{-1}\frac{y}{x}=\log y+c$

8. The solution of the differential equation $\left(1+y^2\right)dx+\left(x-e^{-\tan^{-1}y}\right)dy=0$ is:

   1) $ye^{\tan^{-1}x}=\tan^{-1}x+c$ 2) $xe^{\tan^{-1}y}=\tan^{-1}y+c$

3) $y = \tan^{-1} x.e^{\tan^{-1} x} + c$ 4) $y = xe^{\tan^{-1} x} + c$

9. A differential equation associated to the primitive $y = a + be^{5x} + ce^{-7x}$ is:
1) $y_3+2y_2-y_1=0$ 2) $4y_3+5y_2-20y_1=0$
3) $y_3+2y_2-35y_1=0$ 4) None of the above

10. A solution of the differential equation $\left(\frac{dy}{dx}\right)^2 - x\frac{dy}{dx} + y = 0$ is
1) y=2 2) y=2z 3) y=2x-4 4) $y=2x^2-4$

<u>Homogeneous:</u>

11. The solution of $\frac{dy}{dx} = \frac{y^2}{xy - x^2}$ is
1) $e^{y/x} = kx$ 2) $e^{y/x} = ky$ 3) $e^{-y/x} = kx$ 4) $e^{-y/x} = ky$

12. An equation of the curve satisfying $xdy - ydx = \sqrt{x^2 - y^2}dx$ & y(1)=0 is
1) $y = x^2 \log|\sin x|$ 2) $y = x\sin(\log|x|)$ 3) $y^2=x(x-1)^2$ 4) $y=2x^2(x-1)$

<u>Non-Homogeneous</u>:

13. The solution of $\frac{dy}{dx} = \frac{x+y+1}{x+y-1}$ is
1) $e^{y-x} = c(x+y)$ 2) $e^{y-x} = c(x-y)$ 3) $e^{y+x}=c(x+y)$ 4) $e^{y-x}=c(2x+y)$

<u>Linear Equation</u>

14. The solution of $\cos^2 x\frac{dy}{dx} + y = \tan x$ is
1) $ye^{\tan x} = (\tan x - 1)e^{\tan x} - \tan x + C$ 2) $ye^{\tan x} = (\tan x + 1)e^{\tan x} + \tan x + C$
3) $ye^{\tan x} = (\tan x + 1)e^{\tan x} + C$ 4) $ye^{\tan x} = (\tan x - 1)e^{\tan x} + \tan x + C$

15. The solution of $\frac{dy}{dx} + y\cot x = 4x\,\mathrm{cosec}\,x$ given that y=0; x= $\frac{\pi}{2}$ is
1) $y\sin x = 2x^2 - \frac{\pi}{3}$ 2) $y\sin x = x^2 - \frac{\pi^2}{2}$
3) $y\sin x = 2x^2 - \frac{\pi^2}{2}$ 4) $y\sin x = 2x^2 + \frac{\pi^2}{2}$

Bernoulli's Equation:

16. The general solution of $e^y\left(\frac{dy}{dx}\right)+2\frac{e^x}{x}=\sin x$ is

1) $xe^y=-x\cos x+\sin x+c$ 2) $x^2e^y=-x^2\cos x+2x\sin x-\cos x+c$

3) $xe^y=x\cos x-\sin x+c$ 4) $e^y=-\cos x+\frac{2\sin x}{x}+\frac{2\cos x}{x^2}+\frac{c}{x^2}$

17. Solution of $xy-\frac{dy}{dx}=y^3e^{-x^2}$ is

1) $e^{-x^2}=y^2(2x-c)$ 2) $e^{x^2}=y^2(2x-c)$

3) $y^2=e^{x^2}(2x-c)$ 4) $y^2=e^{-x^2}(2x-c)$

18. The solution of $\frac{dy}{dx}+\frac{y}{x}=x^2y^6$ is

1) $\frac{1}{x^5y^5}=\frac{5}{2x^2}+c$ 2) $\frac{1}{x^5y^5}=\frac{5}{x^2}+c$

3) $\frac{1}{x^5y^5}=\frac{5}{2x^2}+c$ 4) $\frac{1}{x^2y^2}=\frac{5}{2x^2}+c$

19. The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^{3/2}=\left(\left(\frac{dy}{dx}\right)^2+y\right)^{2/3}$ is _____

1) 3/2 2) 3 3) 6 4) 9

20. The solution of $\frac{dy}{dx}+x\sin 2y=x^2\cos^2 y$ (or) $\sec^2 y\frac{dy}{dx}+2x\tan y=x^3$

1) $\tan y=\frac{x^2}{2}+\frac{1}{2}ce^{-x^2}$ 2) $\tan y=\frac{x^2}{2}-\frac{1}{2}+ce^{-x^2}$

3) $\tan y=\frac{x^2}{2}-\frac{1}{2}+ce^{x^2}$ 4) $\cos y=\frac{x^2}{2}-\frac{1}{2}+ce^{-x^2}$

KEY

1) **4**	2) **2**	3) **3**	4) **-**	5) **1**	6) **1**	7) **-**	8) **2**	9) **3**	10) **-**
11) **2**	12) **2**	13) **1**	14) **3**	15) **3**	16) **4**	17) **2**	18) **1**	19) **4**	20) **-**

AIEEE PROBLEMS

1. The differential equation of all circles passing through the origin and having their centres on the x-axis is [2007]

   1) $x^2 = y^2 + xy\dfrac{dy}{dx}$ 2) $x^2 = y^2 + 3xy\dfrac{dy}{dx}$ 3) $y^2 = x^2 + 2xy\dfrac{dy}{dx}$ 4) $y^2 = x^2 - 2xy\dfrac{dy}{dx}$

2. The differential equation for the family of curves $x^2 + y^2 - 2ay = 0$, where a is an arbitrary constant is [2004]

   1) $2(x^2 - y^2)y' = xy$ 2) $(x^2 + y^2)y' = 2xy$
   3) $(x^2 - y^2)y' = 2xy$ 4) $2(x^2 + y^2)y' = xy$

3. The degree and order of the differential equation of the family of all parabola whose axis is x-axis, are respectively [2003]

   1) 1, 2 2) 3, 2 3) 2, 3 4) 2, 1

4. The differential equation representing the family of curves $y^2 = 2c\,(x + \sqrt{c})$, where $c > 0$, is a parameter, is of order and degree as follows. [2005]

   1) order1, degree2 2) order1, degree1 3) order1, degree3 4) order2, degree2

5. The differential equation whose solution is $Ax^2 + By^2 = 1$, where A and B are arbitrary constants is of [2006]

   1) first order and first degree 2) second order and first degree
   3) second order and second degree 4) first order and second degree

6. The normal to a curve at $P(x, y)$ meets the x-axis at G. If the distance of G from the origin is twice the abscissa of P, then the curve is a [2007]

   1) ellipse 2) parabola 3) circle 4) hyperbola

7. If $x\dfrac{dy}{dx} = y(\log y - \log x + 1)$, then the solution of the equation is[2005]

   1) $y \log\left(\dfrac{x}{y}\right) = cx$ 2) $x \log\left(\dfrac{y}{x}\right) = cy$ 3) $\log\left(\dfrac{y}{x}\right) = cx$ 4) $\log\left(\dfrac{x}{y}\right) = cy$

8. The solution of the differential equation $(1 + y^2) + (x - e^{Tan^{-1}y})\dfrac{dy}{dx} = 0$, is [2003]

   1) $2x\, e^{Tan^{-1}y} = e^{2Tan^{-1}y} + k$ 2) $x\, e^{Tan^{-1}y} = e^{Tan^{-1}y} + k$
   3) $x\, e^{2Tan^{-1}y} = e^{-\tan^{-1}y} + k$ 4) $(x - 2)\, k\, e^{-\tan^{-1}y}$

KEY

1) 3	2) 3	3) 1	4) 3	5) 2	6) 1	7) 3	8) 1