



Tsl11M

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14) If  $(1, 2, 4)$  and  $(2, -3\lambda, -3)$  are initial and terminal points of the vector  $\vec{i} + 5\vec{j} - 7\vec{k}$  the value of  $\lambda$  is equal to

- a)  $\frac{7}{3}$                       b)  $-\frac{7}{3}$                       c)  $-\frac{5}{3}$                       d)  $\frac{5}{3}$

15)  $\lim_{x \rightarrow 0} \frac{e^{\sin x} - 1}{x} =$

- a) 1                      b) e                      c)  $\frac{1}{e}$                       d) 0

16)  $\frac{d}{dx} (e^{x+5} \log x)$  is

- a)  $e^x \cdot x^4 (x+5)$                       b)  $e^x \cdot x(x+5)$                       c)  $e^x + \frac{5}{x}$                       d)  $e^x - \frac{5}{x}$

17) If  $f(x) = x+2$  then  $f[f(x)]$  at  $x = 4$  is

- a) 8                      b) 1                      c) 4                      d) 5

18)  $\int 2^{3x+5} dx$  is

- a)  $\frac{3(2^{3x+5})}{\log 2} + c$                       b)  $\frac{2^{3x+5}}{2 \log(3x+5)} + c$                       c)  $\frac{2^{3x+5}}{2 \log 3} + c$                       d)  $\frac{2^{3x+5}}{3 \log 2} + c$

19) The pt of intersection of the line  $x+3y+2 = 0$  and  $2x-y-3 = 0$  is

- a)  $(1, 1)$                       b)  $(-1, 1)$                       c)  $(1, -1)$                       d)  $(-1, -1)$

20) The minor of the element in the  $i^{\text{th}}$  row,  $j^{\text{th}}$  column is denoted by

- a)  $M_{ij}$                       b)  $M_{ji}$                       c)  $(-1)^{i+j} M_{ij}$                       d)  $(-1)^{j+i} M_{ji}$

**II. Answer any 7 questions. Qn.no. 30 is compulsory.**

**7x2=14**

21) If  $A = \{1, 2, 3, 4\}$  and  $B = \{3, 4, 5, 6\}$  find  $n[(A \cup B) \times (A \cap B) \times (A \Delta B)]$

22) If  $a$  and  $b$  are roots of the equation  $x^2 - px + q = 0$ . Find the value of  $\frac{1}{a} + \frac{1}{b}$

23) Find the general solution of  $\sec \theta = -2$

24) A mathematics club has 15 members. In that 8 are girls 6 of the members are to be selected for a competition and half of them should be girls. How many ways of these selection are possible?

25) Expand  $(1+x)^{\frac{2}{3}}$  upto four terms for  $|x| < 1$

26) Find the value of  $K$ , if the equation  $12x^2 + 7xy - 12y^2 - x + 7y + k = 0$  represents a pair of straight line.

27) For what value of  $x$ , the matrix  $A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & x^3 \\ 2 & -3 & 0 \end{bmatrix}$  is skew symmetric.

28) Find the angle between the vectors  $5\vec{i} + 3\vec{j} + 4\vec{k}$  and  $6\vec{i} - 8\vec{j} - \vec{k}$

29) If  $y = \frac{x+1}{x-1}$  then find  $\frac{dy}{dx}$

30) Evaluate:  $\int \sqrt{4-x^2} dx$

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7x3=21

III. Answer any 7 questions. Qn. no. 40 is compulsory.

31) Draw the graph  $f(x) = |x|$ ,  $f(x) = |x-1|$ ,  $f(x) = |x+1|$

32) If  $f: [R - \{-1, 1\}] \rightarrow R$  is defined by  $f(x) = \frac{x}{x^2 - 1}$ , verify whether  $f$  is one-to-one or not.

33) Prove that  $32\sqrt{3}, \sin \frac{\pi}{48}, \cos \frac{\pi}{48}, \cos \frac{\pi}{24}, \cos \frac{\pi}{12}, \cos \frac{\pi}{6} = 3$

34) Find the rank of the word BLEAT

35) If  $a, b, c$  are in geometric progression and if  $a^{1/x} = b^{1/y} = c^{1/z}$  then prove that  $x, y, z$  are in arithmetic progression.

36) Find the equation of lines passing through the point of intersection of lines  $4x - y + 3 = 0$  and  $5x + 2y + 7 = 0$  and (i) through the point  $(-1, 2)$  (ii) parallel to  $x - y + 5 = 0$ .

37) Find the area of the triangle whose vertices are  $(-2, -3), (3, 2)$  and  $(-1, -8)$

38) Evaluate  $\lim_{x \rightarrow 0} \frac{\sin x (1 - \cos x)}{x^3}$

39) Evaluate:  $\int e^{-4x} \sin 2x dx$

40) If ABCD is a quadrilateral and E and F are the mid points of AC and BD respectively then prove that  $\overline{AB} + \overline{AD} + \overline{CB} + \overline{CD} = 4\overline{EF}$

7x5=35

IV. Answer all the questions:

41) a] Write the value of  $f$  at  $-4, 1, -2, 7, 0$  if  $f(x) = \begin{cases} -x + 4, & \text{if } -\infty < x \leq -3 \\ x + 4, & \text{if } -3 < x < -2 \\ x^2 - x, & \text{if } -2 \leq x < 1 \\ x - x^2, & \text{if } 1 \leq x < 7 \\ 0, & \text{otherwise} \end{cases}$

(OR)

b] Prove that  $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc \left( 1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c} \right)$

42) a] If  $A+B+C = \pi$ ,  
prove that  $\cos^2 A + \cos^2 B + \cos^2 C = 1 - 2 \cos A \cos B \cos C$

(OR)

b] Show that  $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$

43) a] Express the matrix  $A = \begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$  as a sum of symmetric and a skew-symmetric matrices.

(OR)

b] Solve  $\log_{5-x}(x^2 - 6x + 65) = 2$

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- 44) a] Show that the equation  $9x^2 - 24xy + 16y^2 - 12x + 16y - 12 = 0$  represents a pair of parallel lines. Find the distance between them.

(OR)

b] Evaluate:  $\int \frac{3x+5}{x^2+4x+7} dx$

- 45) a] Resolve the rational expressions into partial fractions  $\frac{9}{(x+1)(x+2)^2}$

(OR)

- b] The AM of two numbers exceeds their GM by 10 and HM by 16. Find the numbers.

- 46) a] Prove that  $\sqrt[3]{x^2+7} - \sqrt[3]{x^2+4}$  is approximately equal to  $\frac{1}{x^2}$  when  $x$  is large.

(OR)

- b] Show that the points whose position vectors  $4\bar{i} + 5\bar{j} + \bar{k}$ ,  $-\bar{j} - \bar{k}$ ,  $3\bar{i} + 9\bar{j} + 4\bar{k}$  and  $-4\bar{i} + 4\bar{j} + 4\bar{k}$  are coplanar.

- 47) a] If  $y = (\cos^{-1}x)^2$ , prove that  $(1-x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} - 2 = 0$ .

Hence find  $y_2$  when  $x = 0$ .

(OR)

b]  $\int \sqrt{9 - (2x+5)^2} dx$

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