

# Aimstutorial MODEL PAPER - 3

## MATHS - 1A

### SECTION - A

I. Answer ALL the following Very Short Answer Questions:

[10 x 2 = 20]

- Find the inverse of the real function of  $f(x) = ax+b$ ,  $a \neq 0$ ,  $a, b \in \mathbb{R}$ .
- Find the domain of the real function  $f(x) = \frac{1}{\sqrt{1-x^2}}$ .
- If  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ ,  $B = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$  and  $2X + A = B$  then find X.
- Find the cofactors of 2 and -5 in the matrix  $\begin{bmatrix} -1 & 0 & 5 \\ 1 & 2 & -2 \\ -4 & -5 & 3 \end{bmatrix}$
- Show that the points  $A(2\bar{i} - \bar{j} + \bar{k})$ ,  $B(\bar{i} - 3\bar{j} - 5\bar{k})$ ,  $C(3\bar{i} - 4\bar{j} - 4\bar{k})$  are the vertices of a right angled triangle.
- Find the angle between the vectors  $\bar{i} + 2\bar{j} + 3\bar{k}$  and  $3\bar{i} - \bar{j} + 2\bar{k}$ .
- Let  $\bar{a} = \bar{i} + \bar{j} + \bar{k}$  and  $\bar{b} = 2\bar{i} + 3\bar{j} + \bar{k}$  find projection vector of  $\bar{b}$  on  $\bar{a}$  and its magnitude.
- Eliminate 'θ' from  $x = a\cos^3\theta$ ,  $y = b\sin^3\theta$ .
- Find a cosine function whose period is 7.
- Prove that  $\cosh^2x - \sinh^2x = 1$ .

### SECTION - B

II. Answer any FIVE of the following Short Answer Questions:

[5 x 4 = 20]

- Show that  $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a - b)(b - c)(c - a)$
- Find  $\lambda$  in order that the four points  $A(3,2,1)$ ,  $B(4,\lambda,5)$ ,  $C(4,2,-2)$  and  $D(6,5,-1)$  be coplanar.
- If  $[\bar{b}\bar{c}\bar{d}] + [\bar{c}\bar{a}\bar{d}] + [\bar{a}\bar{b}\bar{d}] = [\bar{a}\bar{b}\bar{c}]$ , then show that the points with p.v's  $\bar{a}, \bar{b}, \bar{c}, \bar{d}$  are coplanar.
- Show that  $\frac{\tan\theta + \sec\theta - 1}{\tan\theta - \sec\theta + 1} = \frac{1 + \sin\theta}{\cos\theta}$ .
- Solve the equation  $2\cos^2\theta + 11\sin\theta = 7$  and write general solution.
- Find the value of  $\tan\left(\sin^{-1}\frac{3}{5} + \cos^{-1}\frac{5}{\sqrt{34}}\right)$ .
- If  $C = 60^\circ$ , then show that  $\frac{a}{b+c} + \frac{b}{c+a} = 1$ .

**SECTION - C**

**III. Answer any FIVE of the following Long Answer Questions. :**

**[5 x 7 = 35]**

18. If  $f : A \rightarrow B$  is a function and  $I_A, I_B$  are identity functions on  $A, B$  respectively then prove that  $f \circ I_A = f = I_B \circ f$ .
19. By Mathematical Induction, show that  $49^n + 16n - 1$  is divisible by 64 for all positive integer  $n$ .
20. If  $A$  is a non-singular matrix then prove that  $A^{-1} = \frac{1}{\det A} (\text{Adj } A)$
21. Solve the system of equations by Matrix inverse method,  $2x - y + 3z = 8, x + 2y + z = 4, 3x + y - 4z = 0$ .
22. If  $\vec{a} = 2\vec{i} + 3\vec{j} + 4\vec{k}, \vec{b} = \vec{i} + \vec{j} - \vec{k}, \vec{c} = \vec{i} - \vec{j} + \vec{k}$ , compute  $\vec{a} \times (\vec{b} \times \vec{c})$  and verify that it is perpendicular to  $\vec{a}$ .
23. If  $A, B, C$  are angles in a triangle, then prove that  $\cos A + \cos B - \cos C = -1 + 4 \cos \frac{A}{2} \cos \frac{B}{2} \sin \frac{C}{2}$ .
24. If  $a = (b - c) \sec \theta$ , prove that  $\tan \theta = \frac{2\sqrt{bc}}{b - c} \sin \frac{A}{2}$ .

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