

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 λ 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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