

0197**SET -**Total No. of Questions - **21**Total No. of Printed Pages - **3**

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Part - III
MATHEMATICS, Paper - I
(Bridge Course)
(English Version)
MODEL QUESTION PAPER
(For the Academic year 2021-22 only)

Time : 3 Hours**Max. Marks : 75****Note:** This question paper consists of two sections A and B.**Section - A****10×3=30****I. Short Answer Type Questions.****(i) Answer ANY TEN questions.****(ii) Each question carries three marks.**

1. If $A = \begin{bmatrix} 2 & 3 & -1 \\ 7 & 8 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 1 \\ 2 & -4 & -1 \end{bmatrix}$, then find $A + B$.

2. $A = \begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$ then show that $A^2 = -I$.

3. $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, find AB .

4. Find the unit vector in the direction of the sum of the vectors.

$$\vec{a} = 2\vec{i} + 2\vec{j} - 5\vec{k} \text{ and } \vec{b} = 2\vec{i} + \vec{j} + 3\vec{k}.$$

5. $\vec{a} = 2\vec{i} + 2\vec{j} - 3\vec{k}$, $\vec{b} = 3\vec{i} - \vec{j} + 2\vec{k}$ then find angle between $2\vec{a} + \vec{b}$ and $\vec{a} + 2\vec{b}$.

6. Find the vector equation of the line passing through the point $2\vec{i} + 3\vec{j} + \vec{k}$ and parallel to the vector $4\vec{i} - 2\vec{j} + 3\vec{k}$.

Turn Over

7. If $3\sin\theta + 4\cos\theta = 5$, then show that $4\sin\theta - 3\cos\theta = 0$.
8. What is the value of $\cos 100^\circ \cos 40^\circ + \sin 100^\circ \sin 40^\circ = ?$
9. Find the value of p , if the straight lines $3x + 4y - 5 = 0$, $2x + 3y - 4 = 0$ and $px + 4y - 6 = 0$ are concurrent.
10. Transform the equation $3x + 4y + 12 = 0$ into slope-intercept form.
11. Find x , if the distance between $(5, -1, 7)$ and $(x, 5, 1)$ is 9 units.
12. Compute $\lim_{x \rightarrow 0} \left(\frac{\sqrt{1+x} - 1}{x} \right)$.
13. Compute $\lim_{x \rightarrow 3} \left(\frac{e^x - e^3}{x - 3} \right)$.
14. Find the derivative of $\frac{2x+3}{5x+7}$.
15. If $y = \sin mx \cdot \cos nx$ then find $\frac{dy}{dx}$.

Section - B

3×15=45

II. Long Answer Type Questions.

- (i) Attempt ANY THREE questions.
- (ii) Each question carries fifteen marks.

16. a) Solve $3x + 4y + 5z = 18$, $2x - y + 8z = 13$ and $5x - 2y + 7z = 20$ by using the Matrix Inversion Method. (8)
- b) Find the adjoint and inverse of the matrix $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$. (7)
17. a) Solve the equations $5x - 6y + 4z = 15$, $7x + 4y - 3z = 19$ and $2x + y + 6z = 46$ by using Cramer's Rule. (8)
- b) If $A = \begin{bmatrix} 1 & -2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$ then find $A^3 - 3A^2 - A - 3I$, where I is the unit matrix of order 3. (7)

18. a) If $\bar{a}, \bar{b}, \bar{c}$ are non-coplanar vectors, then test for the collinearity of the following points whose position vectors is given by $3\bar{a} - 4\bar{b} + 3\bar{c}, -4\bar{a} + 5\bar{b} - 6\bar{c}, 4\bar{a} - 7\bar{b} + 6\bar{c}$. (8)
- b) If $\bar{a} = \bar{i} - 2\bar{j} - 3\bar{k}, \bar{b} = 2\bar{i} + \bar{j} - \bar{k}, \bar{c} = \bar{i} + 3\bar{j} - 2\bar{k}$ then compute $\bar{a} \cdot (\bar{b} \times \bar{c})$. (7)
19. a) If A, B, C are angles in a triangle, then show that $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$. (8)
- b) Prove that $\left(\frac{\sin 2A}{1 - \cos 2A} \right) \left(\frac{1 - \cos 2A}{\cos A} \right) = \tan \frac{A}{2}$. (7)
20. a) Find the foot of the perpendicular drawn from (4, 1) upon the straight line $3x - 4y + 12 = 0$. (8)
- b) The vertices of a triangle are A(1, 2, 3), B(2, 3, 1) and C(3, 1, 2). Find $|\underline{A}|, |\underline{B}|$ and $|\underline{C}|$. (7)
21. a) If $x^{2/3} + y^{2/3} = a^{2/3}$, then show that $\frac{dy}{dx} = -\sqrt[3]{\frac{y}{x}}$. (8)
- b) Find the equations of tangent and normal to the curve $y = x^3$ at (1, 1). (7)
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