

Total No. of Questions – 15

Total No. of Printed Pages – 2

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MATHEMATICS (Bridge Course) for Bi. P. C. Candidates, Paper-I
(English Version)

Time : 3 Hours]

[Max. Marks : 75

Note : This question paper consists of **two** sections A and B.

SECTION – A

10 × 3 = 30

Short answer type questions :

- (i) Answer **all** the questions.
 (ii) Each question carries **three** marks.

1. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$ is a symmetric matrix, then find x .

2. If the vectors $-3\bar{i} + 4\bar{j} + \lambda\bar{k}$ and $\mu\bar{i} + 8\bar{j} + 6\bar{k}$ are collinear vectors, then find λ and μ .

3. Find the equation of the plane passing through the point (3, -2, 1) and perpendicular to the vector (4, 7, -4).

4. Find the minimum and maximum of values of $3 \cos x + 4 \sin x$.

5. Prove that $\frac{1}{\sin 10^\circ} - \frac{\sqrt{3}}{\cos 10^\circ} = 4$.

6. Transform the equation $x + y + 1 = 0$ into normal form.

7. Find the point of intersection of the following lines :

$$4x + 8y - 1 = 0, 2x - y + 1 = 0$$

8. Show that points (1, 2, 3), (2, 3, 1) and (3, 1, 2) form an equilateral triangle.

9. Compute $\lim_{x \rightarrow \pi/2} \left(\frac{\cos x}{x - \pi/2} \right)$.

10. If $f(x) = \sqrt{2x-3} + \sqrt{7-3x}$ then find $f'(x)$.

SECTION - B

3 × 15 = 45

II. Long Answer Type questions :

(i) Attempt any **three** questions.

(ii) Each question carries **fifteen** marks.

11. (a) Solve $2x - y + 3z = 9$, $x + y + z = 6$, $x - y + z = 2$ by using Matrix Inversion Method.

(b) Solve that
$$\begin{vmatrix} b+c & c+a & a+b \\ a+b & b+c & c+a \\ a & b & c \end{vmatrix} = a^3 + b^3 + c^3 - 3abc.$$

12. (a) Show that the points (5, -1, 1), (7, -4, 7), (1, -6, 10) and (-1, -3, 4) are the vertices of a rhombus.

(b) If $\vec{a} = 2\vec{i} + 3\vec{j} + 4\vec{k}$, $\vec{b} = \vec{i} + \vec{j} - \vec{k}$ and $\vec{c} = \vec{i} - \vec{j} + \vec{k}$, then compute $\vec{a} \times (\vec{b} \times \vec{c})$ and verify that it is perpendicular to \vec{a} .

13. (a) Prove that $\sin \frac{\pi}{5} \sin \frac{2\pi}{5} \sin \frac{3\pi}{5} \sin \frac{4\pi}{5} = \frac{5}{16}$.

(b) If A, B, C are angles in a triangle, then prove that

$$\sin A + \sin B - \sin C = 4 \sin \frac{A}{2} \sin \frac{B}{2} \cos \frac{C}{2}.$$

14. (a) Find the circumcentre of the triangle whose vertices are (-2, 3), (2, -1), (4, 0).

(b) Find the equations of the straight lines passing through the point (-3, 2) and making an angle of 45° with straight line $3x - y + 4 = 0$.

15. (a) If $y = x^2 e^x \sin x$, then find $\frac{dy}{dx}$.

(b) Find the angle between the curves $x + y + 2 = 0$, $x^2 + y^2 - 10y = 0$.