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III

Total No. of Questions – 15
Total No. of Printed Pages – 2

Regd. No.

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**

I. Short answer type questions :

(i) Answer **all** the questions.

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

1. If $\begin{bmatrix} x-3 & 2y-8 \\ z+2 & 6 \end{bmatrix} = \begin{bmatrix} 5 & 2 \\ -2 & a-4 \end{bmatrix}$, then find the values of x, y, z and a.

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

3. If $a = 6i + 2j + 3k$ and $b = 2i - 9j + 6k$, then find $a \cdot b$ and the angle between a and b.

4. Prove that $\sin^2\left(52\frac{1}{2}\right)^\circ - \sin^2\left(22\frac{1}{2}\right)^\circ = \frac{\sqrt{3}+1}{4\sqrt{2}}$.

5. Find the maximum and minimum values of $13\cos x + 3\sqrt{3}\sin x - 4$.

6. Transform the equation $4x - 3y + 12 = 0$ into

   (i) Slope-intercept form

   (ii) Intercept form

7. Find the value of p, if the straight lines $x + p = 0$, $y + 2 = 0$ and $3x + 2y + 5 = 0$ are concurrent.

8. Find the co-ordinates of the vertex 'C' of Δ ABC if its centroid is the origin and the vertices A, B are (1, 1, 1) and (–2, 4, 1) respectively.

9. Evaluate $\lim_{x \to 0} \frac{3^x - 1}{\sqrt{1+x} - 1}$.

10. If $f(x) = \log (\sec x + \tan x)$, find $f'(x)$.

SECTION – B $3 \times 15 = 45$

II. Long answer type questions :

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

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

11. (a) Solve the system of equations :

$$x + y + z = 1$$
$$2x + 2y + 3z = 6$$
$$x + 4y + 9z = 3$$

by using Matrix Inversion method.

(b) Show that $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$ is non-singular and find A^{-1}.

12. (a) If a, b, c are non-coplanar vectors, prove that the four points $-a + 4b - 3c$, $3a + 2b - 5c$, $-3a + 8b - 5c$, $-3a + 2b + c$ are coplanar.

(b) Let $a = 2i + j - 2k$, $b = i + j$.

If c is a vector such that $a \cdot c = |c|$, $|c - a| = 2\sqrt{2}$ and the angle between $a \times b$ and c is 30°, then find the value of $|(a \times b) \times c|$.

13. (a) If $A + B = \frac{\pi}{4}$ then prove that $(1 + \tan A)(1 + \tan B) = 2$.

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

$$\cos A + \cos B + \cos C = 1 + 4 \sin \frac{A}{2} \sin \frac{B}{2} \sin \frac{C}{2}.$$

14. (a) Find the orthocentre of the triangle whose sides are given by $x + y + 10 = 0$, $x - y - 2 = 0$ and $2x + y - 7 = 0$.

(b) Find the value of k, if the straight lines $y - 3kx + 4 = 0$ and $(2k - 1)x - (8k - 1)y - 6 = 0$ are perpendicular.

15. (a) Find the derivative of the function $(\sin x)^{\log x} + x^{\sin x}$.

(b) Find the equations of the tangent and normal to the curve $y^4 = ax^3$ at (a, a).