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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

I. Short answer type questions : $10 \times 3 = 30$

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

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

1. If $A = \begin{bmatrix} 2 & -4 \\ -5 & 3 \end{bmatrix}$, then find $A + A'$ and AA'.

2. Write direction ratios of the vectors $\bar{a} = \bar{i} + \bar{j} - 2\bar{k}$ and hence calculate its direction cosines.

3. If $\bar{a} = \bar{i} + 2\bar{j} - 3\bar{k}$ and $\bar{b} = 3\bar{i} - \bar{j} + 2\bar{k}$, then show that $\bar{a} + \bar{b}$ and $\bar{a} - \bar{b}$ are perpendicular to each other.

4. If A, B, C, D are angles of a cyclic quadrilateral, then prove that $\cos A + \cos B + \cos C + \cos D = 0$.

5. Find the value of $\tan 75° + \cot 75°$.

6. Find the value of y, if the line joining the points (3, y) and (2, 7) is parallel to the line joining the points (– 1, 4) and (0, 6).

7. Find the sum of the squares of the intercepts of the line $4x - 3y = 12$ on the axes of co-ordinates.

8. Find the ratio in which the XZ-plane divides the line joining A(–2, 3, 4) and B(1, 2, 3).

9. Compute $\lim_{x \to 3} \frac{(x^2 - 8x + 15)}{x^2 - 9}$.

10. If $f(x) = 1 + x + x^2 + x^3 + \ldots + x^{100}$, then find $f'(1)$

SECTION – B

$3 \times 15 = 45$

II. Long answer type questions :

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

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

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

(b) Show that $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} = abc\,(a-b)\,(b-c)\,(c-a)$.

12. (a) Find the vector having magnitude $\sqrt{6}$ units and perpendicular to both $2\bar{i} - \bar{k}$ and $3\bar{j} - \bar{i} - \bar{k}$.

(b) If the vectors $\bar{a} = 2\bar{i} - \bar{j} + \bar{k}$ and $\bar{b} = \bar{i} + 2\bar{j} - 3\bar{k}$ and $\bar{c} = 3\bar{i} + p\bar{j} + 5\bar{k}$ are coplanar, then find p.

13. (a) If $\tan(\alpha - \beta) = \frac{7}{24}$ and $\tan\alpha = \frac{4}{3}$, where α and β are in the first quadrant, then prove that $\alpha + \beta = \frac{\pi}{2}$.

(b) Prove that $\frac{1}{\cos 290^\circ} + \frac{1}{\sqrt{3}\sin 250^\circ} = \frac{4}{\sqrt{3}}$.

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

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

15. (a) If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$, then prove that $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$.

(b) Show that the curves $6x^2 - 5x + 2y = 0$ and $4x^2 + 8y^2 = 3$ touch each other at $\left(\frac{1}{2}, \frac{1}{2}\right)$.
