0193 **B**

Total No. of Questions: 24
Total No. of Printed Pages: 3

Regd. No.

MATHEMATICS

Paper – I (B)

(English Version)

Time : 3 Hours **Max. Marks : 75**

Note: This question paper consists of **THREE** Sections **A, B** and **C**.

SECTION – A

(10 × 2 = 20)

I. Very short answer type questions.

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

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

1. Find the slope of the straight line passing through the points (–3, 8) and (10, 5).

2. Transform the equation $3x + 4y = 5$ into

   (a) Slope-intercept form (b) Intercept form

3. Find the distance of P(3, –2, 4) from the origin.

4. Find the equation of the plane whose intercepts on x, y, z axes are 1, 2, 4 respectively.

5. Compute : $\lim_{x \to 1} (x^2 + 2x + 3)$.

6. Compute : $\lim_{x \to \infty} \frac{8|x| + 3x}{3|x| - 2x}$.

7. Find the derivative of $(4 + x^2)\, e^{2x}$.

8. Find the derivative of $\sin^{-1}(3x - 4x^3)$.

9. Find Δy and dy for the function $y = x^2 + 3x + 6$ for the values $x = 10$ and $\Delta x = 0.01$.

10. Verify Rolle's theorem for the function $x^2 - 1$ on $[-1, 1]$.

SECTION – B

(5 × 4 = 20)

II. Short answer type questions:

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

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

11. The ends of the hypotenuse of a right angled triangle are (0, 6) and (6, 0). Find the equation of the locus of its third vertex.

12. When the origin is shifted to the point (2, 3) the transformed equation of a curve is $x^2 + 3xy - 2y^2 + 17x - 7y - 11 = 0$. Find the original equation of the curve.

13. Find the foot of the perpendicular drawn from (4, 1) upon the straight line $3x - 4y + 12 = 0$.

14. Check the continuity of the following function at 2.

$$f(x)=\begin{cases}\frac{1}{2}(x^2-4), & \text{if } 0<x<2\\ 0, & \text{if } x=2\\ 2-8x^{-3}, & \text{if } x>2\end{cases}$$

15. Find the derivative of Sin2x from the first principle.

16. Find the equations of tangent and normal to the curve $y = x^3 + 4x^2$ at $(-1, 3)$.

17. The displacement s of a particle travelling in a straight line in t seconds is given by $s = 45t + 11t^2 - t^3$. Find the time when the particle comes to rest.

[Cont.

SECTION – C (5 × 7 = 35)

III. Long answer type questions.

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

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

18. Find the circumcenter of the triangle whose vertices are (1, 3), (–3, 5) and (5, –1).

19. The equation $ax^2 + 2hxy + by^2 = 0$ represents a pair of straight lines and θ is the angle between the lines. Then show that

$$\cos\theta = \frac{|a+b|}{\sqrt{(a-b)^2+4h^2}}.$$

20. Show that the lines joining the origin to the points of intersection of the curve $x^2 - xy + y^2 + 3x + 3y - 2 = 0$ and the straight line $x - y - \sqrt{2} = 0$ are mutually perpendicular.

21. Find the angle between the lines whose direction cosines satisfy the equations $l + m + n = 0$, $l^2 + m^2 - n^2 = 0$.

22. If $x^{\log y} = \log x$ then prove that $\frac{dy}{dx} = \frac{y}{x}\left[\frac{1-\log x \log y}{(\log x)^2}\right]$.

23. At any point t on the curve $x = a(t + \sin t)$, $y = a(1 - \cos t)$, find the lengths of tangent, normal.

24. Find two positive numbers whose sum is 15 so that the sum of their squares is minimum.