193

(New Syllabus)



Total No. of Questions - 24

Total No. of Printed Pages - 3

	,		-	 		 	
Regd.		1			1		
			1 3		1		
No.					- 1		
1875							

Part - III

MATHEMATICS, Paper - I (B)

(Co-ordinate Geometry and Calculus)

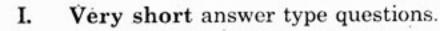
(English Version)

Time: 3 hours

Max. Marks: 75

Note: This question paper consists of three sections A, B and C.

SECTION A



 $10 \times 2 = 20$

- i) Attempt all questions.
- ii) Each question carries two marks.
- 1. Find the equation of the straight line passing through (-2, 4) and making nonzero intercepts whose sum is zero.
- 2. Find the distance between the parallel straight lines 3x + 4y 3 = 0 and 6x + 8y 1 = 0.
- 3. Reduce the equation x+2y-3z-6=0 of the plane to the normal form.
- 4. Compute $\lim_{x \to 0} \frac{e^{7x} 1}{x}$.
- 5. Show that $\lim_{x \to \infty} \left(\sqrt{x+1} \sqrt{x} \right) = 0$.
- If (3, 2, -1), (4, 1, 1) and (6, 2, 5) are three vertices and (4, 2, 2) is the centroid of a tetrahedron, find the fourth vertex.
- 7. If $y = (Cot^{-1}x^3)^2$, then find $\frac{dy}{dx}$.

- 8. If $y = e^{2x} \cdot Log(3x+4)\left(x > \frac{-4}{3}\right)$, then find $\frac{dy}{dx}$.
- 9. If $y = e^x + x$, x = 5, $\Delta x = 0.02$, then find Δy and dy.
- 10. Find the value of 'c' in Rolle's theorem for the function $f(x) = x^2 1$ on [-1, 1].

SECTION B

Short answer type questions.

 $5\times4=20$

- Attempt any five questions.
- ii) Each question carries four marks.
- 11. Find the equation of the locus of P, if A = (4,0), B = (-4,0) and |PA PB| = 4.
- 12. When the axes are rotated through an angle $\frac{\pi}{6}$ find the transformed equation of $x^2 + 2\sqrt{3}xy y^2 = 2a^2$.
- 13. If p and q are the lengths of the perpendiculars from the origin to the straight lines $x Sec \alpha + y Cosec \alpha = a$ and $x Cos \alpha y Sin \alpha = a Cos 2\alpha$, prove that $4p^2 + q^2 = a^2$.
- 14. Find the real constants a, b so that the function f given by

$$f(x) = \begin{cases} Sin x & \text{if } x \le 0 \\ x^2 + a & \text{if } 0 < x < 1 \\ bx + 3 & \text{if } 1 \le x \le 3 \\ -3 & \text{if } x > 3 \end{cases}$$

is continuous on R.

- 15. Find the derivative of Sin 2x from the first principle.
- 16. A container is in the shape of an inverted cone has a height 8 m and radius 6 m at the top. If it is filled with water at the rate of 2 m³/minute, how fast is the height of water changing when the level is 4 m?
- 17. Find the equations of the tangent and the normal to the curve $y^4 = ax^3$ at (a, a).

SECTION C

III. Long answer type questions.

 $5 \times 7 = 35$

- i) Attempt any five questions.
- ii) Each question carries seven marks.
- 18. Find the orthocenter of the triangle whose sides are given by x + y + 10 = 0, x y 2 = 0 and 2x + y 7 = 0.
- 19. If the equation $ax^2 + 2hxy + by^2 = 0$ represents a pair of intersecting lines, then prove that the combined equation of the pair of bisectors of the angles between these lines is $h(x^2 y^2) = (a b)xy$.
- 20. Find the condition for the chord lx + my = 1 of the circle $x^2 + y^2 = a^2$ (whose center is the origin) to subtend a right angle at the origin.
- 21. Find the angle between the diagonals of a cube.
- 22. If $y = x^{Tan x} + (Sin x)^{Cos x}$, find $\frac{dy}{dx}$.
- 23. Find the angle between the curves xy = 2 and $x^2 + 4y = 0$.
- 24. If the curved surface of a right circular cylinder inscribed in a sphere of radius R is maximum, show that the height of the cylinder is $\sqrt{2}R$.