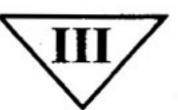
193



Total No. of Questions - 24

Total No. of Printed Pages - 3

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Part – III 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

 $10 \times 2 = 20$

- I. Very short answer type questions:
 - (i) Answer all questions.
 - (ii) Each question carries two marks.
 - 1. Find the value of x, if the slope of the line passing through (2, 5) and (x, 3) is 2.
 - 2. Find the sum of the squares of the intercepts of the line 4x 3y = 12 on the axes of co-ordinates.
 - 3. Show that the points (1, 2, 3), (2, 3, 1) and (3, 1, 2) form an equilateral triangle.
 - 4. Find the intercepts of the plane 4x + 3y 2z + 2 = 0 on the co-ordinate axes.
 - 5. Compute $\lim_{x \to 0} \frac{e^{3x} 1}{x}$
 - 6. Compute $\lim_{x \to \infty} \frac{11x^3 3x + 4}{13x^3 5x^2 7}$.
 - 7. If $f(x) = \sin(\log x)$, (x > 0) then find f'(x).

- 8. If $y = x^4 + \tan x$ then find y".
- If the increase in the side of a square is 4% then find the approximate percentage of increase in the area of the square.
- 10. Verify Rolle's theorem for the function $f(x) = x(x+3) e^{-\frac{x}{2}}$ in [-3,0].



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- II. Short answer type questions:
 - (i) Attempt any five questions.
 - (ii) Each question carries four marks.
 - 11. Find the equation of the locus of P, if A = (2, 3), B = (2, -3) and BA + PB = 8.
 - 12. When the origin is shifted to (-1, 2) by the translation of axes, find the transformed equation of $x^2 + y^2 + 2x 4y + 1 = 0$.
 - 13. Show that the lines 2x + y 3 = 0, 3x + 2y 2 = 0 and 2x 3y 23 = 0 are concurrent and find the point of concurrency.
 - 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 the function $\sin 2x$ from the first Principle.

- 16. A particle is moving along a line according to S = f(t) = 4t³ 3t² + 5t 1 where S is measured in metres and t is measured in seconds. Find the velocity and acceleration at time t. At what time the acceleration is zero?
- 17. At any point t on the curve x = a (t + sin t); y = a (1 cos t), find the lengths of tangent, normal, subtangent and subnormal.

SECTION - C

 $5 \times 7 = 35$

III. Long Answer Type questions:

- (i) Attempt any five questions.
- (ii) Each question carries seven marks.
- 18. Find the circumcentre of the triangle whose vertices are (1, 3), (0, -2) and (-3, 1).
 - 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 angle between the straight lines joining the origin to the points of intersection of the curve $7x^2 4xy + 8y^2 + 2x 4y 8 = 0$ with the straight line 3x y = 2.
 - 21. Find the direction cosines of two lines which are connected by the relations l 5m + 3n = 0 and $7l^2 + 5m^2 3n^2 = 0$.
 - 22. If $y = x^{\tan x} + (\sin x)^{\cos x}$, find $\frac{dy}{dx}$.
 - 23. Find the angle between the curves $y^2 = 8x$, $4x^2 + y^2 = 32$.
 - 24. Find two positive integers whose sum is 16 and the sum of whose squares is minimum.