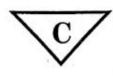
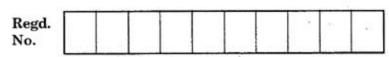
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 $\frac{193}{(TS)}$



Total No. of Questions - 24

Total No. of Printed Pages - 4



Part - III

MATHEMATICS, Paper - I (B)

(Coordinate 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 × 2 - 20

- I. Very short answer type questions.
 - i) Attempt all questions.
 - ii) Each question carries two marks.
 - 1. Transform the equation $\sqrt{3}x + y = 4$ into
 - i) Slope intercept form
- ii) Intercept form
- 2. Find the value of p if the straight lines 3x+7y-1=0 and 7x-py+3=0 are mutually perpendicular.
- 3. Show that the points (1, 2, 3), (7, 0, 1), (-2, 3, 4) are collinear.
- 4. Reduce the equation x+2y-3z-6=0 of the plane to the normal form.
- 5. Compute $\frac{Lim}{x \to 3} \frac{x^2 8x + 15}{x^2 9}$.



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6. Compute
$$\lim_{x \to 0} \frac{e^x - \sin x - 1}{x}$$
.

7. Find the derivative of $Sin^{-1}(3x-4x^3)$ with respect to 'x'.

8. If
$$2x^2 - 3xy + y^2 + x + 2y - 8 = 0$$
, then find $\frac{dy}{dx}$.

- 9. Find dy and Δy of $y = f(x) = x^2 + x$ at x = 10 when $\Delta x = 0.1$.
- 10. Find the length of subtangent at a point on the curve $y=bSin\left(\frac{x}{a}\right)$.

SECTION B

 $5 \times 4 = 20$

- II. Short answer type questions.
 - i) Attempt any five questions.
 - ii) Each question carries four marks.
 - Find the equation of locus of a point, the sum of whose distances from (0, 2) and (0, -2) is 6.
 - 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 curve.
 - 13. Find the equation of the straight line parallel to the line 3x+4y=7 and passing through the point of intersection of the lines x-2y-3=0, x+3y-6=0.

14. Check the continuity of 'f' given by

$$f(x) = \begin{cases} 4 - x^2 & \text{if } x \le 0 \\ x - 5 & \text{if } 0 < x \le 1 \\ 4x^2 - 9 & \text{if } 1 < x < 2 \\ 3x + 4 & \text{if } x \ge 2 \text{ at points} \end{cases}$$

$$x = 0, 1, 2.$$

- 15. $x=a(Cost+tSint), y=a(Sint-tCost) find \frac{dy}{dx}$
- 16. Find the equation of tangent and normal to the curve $y=2.e^{\frac{-x}{3}}$ at the point where the curve meets the Y-axis.
- 17. A point P is moving on the curve $y=2x^2$. The x coordinate of P is increasing at the rate of 4 units per second. Find the rate at which y coordinate is increasing when the point is at (2, 8).

SECTION C

 $5 \times 7 = 35$

- III. Long answer type questions.
 - i) Attempt any five questions.
 - ii) Each question carries seven marks.
 - 18. The base of an equilateral triangle is x+y-2=0 and the opposite vertex is (2, -1). Find the equations of the remaining sides.
 - 19. If the second degree equation $S = ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0 \text{ in two variables } x \text{ and } y \text{ represents a pair of straight lines, then prove that}$

i)
$$abc + 2fgh - af^2 - bg^2 - ch^2 = 0$$

ii) $h^2 \ge ab$, $g^2 \ge ac$, $f^2 \ge bc$

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- 20. Find the 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 and also the angle between them.
- 21. Find the direction cosines of the two lines which are connected by the relations l-5m+3n=0, $7l^2+5m^2-3n^2=0$.

22. If
$$x^y + y^x = a^b$$
 then prove that
$$\frac{dy}{dx} = -\left[\frac{yx^{y-1} + y^x \operatorname{Log} y}{x^y \operatorname{Log} x + xy^{x-1}}\right].$$

- 23. If the curved surface of right circular cylinder inscribed in a sphere of radius 'r' is maximum, show that the height of the cylinder is $\sqrt{2} r$.
- 24. If $ax^2 + by^2 = 1$, $a_1x^2 + b_1y^2 = 1$, then show that the condition for orthogonality of above curves is $\frac{1}{a} \frac{1}{b} = \frac{1}{a_1} \frac{1}{b_1}$.