193
(TS)

C

Total No. of Questions - 24
Total No. of Printed Pages - 4

Regd. No.

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

$10 \times 2 = 20$

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

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

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

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

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 $y = b\sin\left(\dfrac{x}{a}\right)$.

SECTION B **5 × 4 = 20**

II. Short answer type questions.

i) Attempt **any five** questions.

ii) Each question carries **four** marks.

11. 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. $x=a(Cost+t\,Sint),\ y=a(Sint-t\,Cost)$ find $\dfrac{dy}{dx}$.

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 × 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 $S\equiv ax^2+2hxy+by^2+2gx+2fy+c=0$ in two variables x and y represents a pair of straight lines, then prove that

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

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

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 $\frac{dy}{dx}=-\left[\frac{yx^{y-1}+y^x \, Log\, y}{x^y \, Log\, x+xy^{x-1}}\right]$.

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 $\frac{1}{a}-\frac{1}{b}=\frac{1}{a_1}-\frac{1}{b_1}$.