

193

II

Total No. of Questions – 24

Regd.

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 × 2 = 20

I. Very Short Answer Type questions :

- (i) Answer **all** questions.  
(ii) Each question carries **two** marks.

1. Find the slopes of the lines  $x + y = 0$  and  $x - y = 0$ .
2. Transform the equation  $x + y + 1 = 0$  into normal form.
3. 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.
4. Find the angle between the planes  $2x - y + z = 6$  and  $x + y + 2z = 7$ .
5. Compute  $\lim_{x \rightarrow 0} \frac{e^{7x} - 1}{x}$
6. Compute  $\lim_{x \rightarrow \infty} \frac{x^2 + 5x + 2}{2x^2 - 5x + 1}$
7. Find the derivative of  $5 \sin x + e^x \log x$ .

8. Find the derivative of  $\sec^{-1}\left(\frac{1}{2x^2-1}\right)$ ,  $\left(0 < x < \frac{1}{\sqrt{2}}\right)$ .
9. Find  $dy$  and  $\Delta y$  of  $y = f(x) = x^2 + x$  at  $x = 10$  when  $\Delta x = 0.1$
10. Verify Rolle's theorem for the function  $y = f(x) = x^2 + 4$  in  $[-3, 3]$ .

## SECTION - B

 $5 \times 4 = 20$ 

## II. Short Answer Type questions :

- (i) Attempt any **five** questions.
- (ii) Each question carries **four** marks.
11. A(1, 2), B(2, -3) and C(-2, 3) are three points. A point P moves such that  $PA^2 + PB^2 = 2PC^2$  then find the equation of locus of P.
12. When the axes are rotated through an angle  $\frac{\pi}{4}$ , find the transformed equation of  $3x^2 + 10xy + 3y^2 = 9$
13. Find the value of P, if the lines  $3x + 4y = 5$ ,  $2x + 3y = 4$ ,  $Px + 4y = 6$  are concurrent.
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  $\cot x$  from the first principle.
16. A particle is moving in a straight line so that after 't' seconds its distance is S (in cms) from a fixed point on the line given by  $S = f(t) = 8t + t^3$ . Find (i) the velocity at time  $t = 2$  sec, (ii) the initial velocity and (iii) acceleration at  $t = 2$  sec.
17. Find the equations of tangent and normal to the curve  $xy = 10$  at (2, 5).

## SECTION – C

5 × 7 = 35

## III. Long Answer Type questions :

- (i) Attempt any **five** questions.  
 (ii) Each question carries **seven** marks.

18. Find the circumcenter of the triangle whose vertices are  $(-2, 3)$ ,  $(2, -1)$  and  $(4, 0)$ .

19. Show that the area of the triangle formed by the lines  $ax^2 + 2hxy + by^2 = 0$ ,

$$lx + my + n = 0 \text{ is } \left| \frac{n^2 \sqrt{h^2 - ab}}{am^2 - 2h/m + b/l^2} \right|.$$

20. Find the values of  $K$ , if the lines joining the origin to the points of intersection of the curve  $2x^2 - 2xy + 3y^2 + 2x - y - 1 = 0$  and the line  $x + 2y = K$  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. Find  $\frac{dy}{dx}$ , if  $y = (\sin x)^{\log x} + x^{\sin x}$ .

23. Find the angle between the curves  $xy = 2$ ,  $x^2 + 4y = 0$ .

24. A wire of length  $l$  is cut into two parts which are bent respectively in the form of a square and a circle. What are the lengths of the pieces of the wire respectively so that the sum of the areas is the least ?