

0193
TS



Total No. of Questions – 24

Regd.

Total No. of Printed Pages – 4

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

1. Find the value of 'y', if the line joining the points (3, y) and (2, 7) is parallel to the line joining the points (-1, 4), (0, 6).

2. Find the value of 'p', if the straight lines $x + p = 0$, $y + 2 = 0$ and $3x + 2y + 5 = 0$ are concurrent.

3. Find the fourth vertex of the parallelogram whose consecutive vertices are (2, 4, -1), (3, 6, -1) and (4, 5, 1).

4. Find the angle between the planes $x + 2y + 2z - 5 = 0$ and $3x + 3y + 2z - 8 = 0$.

5. Compute $\lim_{x \rightarrow 0} x^2 \sin\left(\frac{1}{x}\right)$.

6. Compute $\lim_{x \rightarrow \infty} \frac{8|x| + 3x}{3|x| - 2x}$.

7. If $f(x) = 7^{x^3 + 3x}$ ($x > 0$), then find $f'(x)$.

8. If $x = \tan(e^{-y})$, then show that $\frac{dy}{dx} = \frac{-e^y}{1+x^2}$.

9. Find dy and Δy of $y = x^2 + x$ at $x = 10$ when $\Delta x = 0.1$.

10. Verify Rolle's theorem for the function $f : [-3, 8] \rightarrow \mathbb{R}$ be defined by $f(x) = x^2 - 5x + 6$.

SECTION - B

5 × 4 = 20

II. Short answer type questions :

(i) Attempt any **five** questions.

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

11. A(5, 3) and B(3, -2) are two fixed points. Find the equation of locus of P, so that the area of ΔPAB is 9 sq. units.

12. When the axes are rotated through an angle $\frac{\pi}{4}$, find the transformed equation of $3x^2 + 10xy + 3y^2 = 9$.

13. $x - 3y - 5 = 0$ is the perpendicular bisector of the line segment joining the points A, B. If A = (-1, -3), find the coordinates of 'B'.

14. Show that $f(x) = \begin{cases} \frac{\cos ax - \cos bx}{x^2} & \text{if } x \neq 0 \\ \frac{1}{2}(b^2 - a^2) & \text{if } x = 0 \end{cases}$

where a and b are real constants, is continuous at $x = 0$.

15. If $ay^4 = (x + b)^5$ then $5yy'' = (y')^2$.
16. Find the lengths of subtangent, subnormal at a point 't' on the curve $x = a(\cos t + t \sin t)$, $y = a(\sin t - t \cos t)$.
17. The volume of a cube is increasing at a rate of 9 cubic centimetres per second. How fast is the surface area increasing when the length of the edge is 10 centimetres?

SECTION - C

5 × 7 = 35

III. Long answer type questions :

(i) Attempt any **five** questions.

(ii) Each question carries **seven** marks.

18. Find the orthocentre of the triangle whose vertices are (5, -2), (-1, 2) and (1, 4).
19. Show that the area of the triangle formed by the lines $ax^2 + 2hxy + by^2 = 0$ and the line $lx + my + n = 0$ is $\left| \frac{n^2 \sqrt{h^2 - ab}}{am^2 - 2h/m + b/l^2} \right|$.
20. The condition for the line joining the origin to the point of intersection of the circle $x^2 + y^2 = a^2$ and the line $lx + my = 1$ to coincide.
21. Find the direction cosines of two lines which are connected the relation $l + m + n = 0$ and $mn - 2n/l - 2/m = 0$.

22. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ then prove that $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$.

23. At a point (x_1, y_1) on the curve $x^3 + y^3 = 3axy$, show that the tangent is $(x_1^2 - ay_1)x + (y_1^2 - ax_1)y = ax_1y_1$.

24. A window is in the shape of rectangle surmounted by a semicircle. If the perimeter of the window is 20 ft. find the maximum area.