

Total No. of Questions - 24

Regd.

Total No. of Printed Pages - 3

No.

Part - III

MATHEMATICS, Paper - I (B)

(English Version)

Time : 3 Hours

Max. Mark

Note: This question paper consists of THREE Sections A, B and C.

10.

SECTION - A

I. Very short answer type questions :

(i) Attempt **ALL** the questions.(ii) Each question carries **TWO** marks.1. Show that the points $(-5, 1)$, $(5, 5)$, $(10, 7)$ are collinear.

2. Find the distance between parallel lines :

$$5x - 3y - 4 = 0$$

$$10x - 6y - 9 = 0$$

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 :

$$x + 2y + 2z - 5 = 0$$

$$3x + 3y + 2z - 8 = 0$$

5. Compute $\lim_{x \rightarrow 0} \left(\frac{e^x - 1}{\sqrt{1+x} - 1} \right)$.6. Compute $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\cos x}{\left(x - \frac{\pi}{2}\right)}$.7. If $f(x) = 2x^2 + 3x - 5$, then prove that $f'(0) + 3f'(-1) = 0$.8. Find the derivative of $\sin^{-1} \left(\frac{2x}{1+x^2} \right)$.9. Find the approximate value of $\sqrt[3]{65}$.10. Verify Rolle's Theorem for the function $y = f(x) = x^2 + 4$ in $[-3, 3]$.

SECTION - B

5×4=20

II. Short answer type questions.

(i) Attempt **ANY FIVE** questions.

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

11. If the distance from P to the points (2, 3) and (2, -3) are in the ratio 2:3, then find the equation of the locus of P.

12. When the axes are rotated through an angle ' α ', find the transformed equation of $x \cos \alpha + y \sin \alpha = P$.

13. Find the value of K, if the angle between the straight lines $4x - y + 7 = 0$ and $Kx - 5y - 9 = 0$ is 45° .

14. Compute $\lim_{x \rightarrow 0} \left(\frac{\cos ax - \cos bx}{x^2} \right)$

15. Find the derivative of the function ' $\cot x$ ' from the first principle.

16. Find the lengths of sub-tangent and sub-normal at a point on the curve $y = b \sin \left(\frac{x}{a} \right)$.

17. The volume of a cube is increasing at the rate of $8 \text{ cm}^3/\text{sec}$. How fast is the surface area increasing when the length of an edge is 12cm?

SECTION - C

5×7=35

III. Long answer type questions :

(i) Attempt **ANY FIVE** questions.

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

18. Find the equation of the straight line parallel to the line $3x + 4y = 7$ and passing through the point of intersection of the lines $x - 2y - 3 = 0$ and $x + 3y - 6 = 0$.



19. Show that the lines represented by $(lx+my)^2 - 3(mx-ly)^2 = 0$ and $lx + my + n = 0$ form an equilateral triangle with area $\frac{n^2}{\sqrt{3}(l^2+m^2)}$ sq. units.
20. Find the condition for the chord $lx + my = 1$ of the circle $x^2 + y^2 = a^2$ (whose centre is the origin) to subtend a right angle at the origin.
21. Find the angle between the lines whose direction cosines are given by the equations $3l+m+5n = 0$ and $6mn-2nl+5lm = 0$.
22. If $y = x\sqrt{a^2 + x^2} + a^2 \log(x + \sqrt{a^2 + x^2})$, then show that $\frac{dy}{dx} = 2\sqrt{a^2 + x^2}$.
23. If the tangent at any point on the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ intersects the co-ordinate axes in A and B, then show that the length AB is a constant.
24. From a rectangular sheet of dimensions 30cm $\times$ 80cm, four equal squares of side 'x' cm are removed at the corners and the sides are then turned up so as to form an open rectangular box. Find the value of x, so that the volume of the box is the greatest.