III

193

Total No. of Questions - 24

Total No. of Printed Pages - 4

Regd. No.

Part -III

MATHEMATICS, Paper - I (B)

(English Version)

Max. Marks : 75

Time: 3 Hours

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

10×2=20

SECTION - A

I. Very short answer type questions -

(i) Answer ALL the questions.

(ii) Each question carries TWO marks.

1. Transform the equation $4x - 3y + 12 = 0$ into (a) slope - intercept form (b) intercept form.
2. Find the perpendicular distance from the point (-3, 4) to the straight line $5x - 12y = 2$.
3. Find x, if the distance between (5, -1, 7) and (x, 5, 1) is 9 units.
4. Find the equation of the plane whose intercepts on X, Y, Z axes are 1, 2, 4 respectively.
5. Compute $\lim_{x \to 0} \frac{\sin ax}{\sin bx}, b \neq 0, a \neq b$.
6. Compute $\lim_{x \to 2} \frac{x-2}{x^3-8}$.
7. If $y = \log(\sin(\log x))$, then find $\frac{dy}{dx}$.

8. Find the second order of derivative of $y = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$.

9. Find Δy and dy for the function $y = 5x^2 + 6x + 6$, at $x = 2$ and $\Delta x = 0.001$.

10. State Rolle's theorem.

SECTION - B

5×4=20

II. Short answer type questions -

(i) Answer 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 $PA^2 + PB^2 = 2PC^2$. Show that the equation to the locus of P is $7x - 7y + 4 = 0$.

12. When the axes are rotated through an angle 45°, the transformed equation of a curve is $17x^2 - 16xy + 17y^2 = 225$. Find the original equation of the curve.

13. If the straight lines $ax + by + c = 0$, $bx + cy + a = 0$ and $cx + ay + b = 0$ are concurrent, then prove that $a^3 + b^3 + c^3 = 3abc$.

14. Compute $\lim_{x \to 0} \frac{\cos x + \sin^2 x}{x + 1}$.

15. Find the derivative of the function $\tan 2x$ from the first principle.

16. Find the equation of tangent and normal to the curve $y = x^2$ at $(0, 0)$.

17. Find the point on the curve $y = x^3 - 11x + 5$ at which the tangent is $y = x - 11$.

SECTION - C

5×7=35

III. Long answer type questions -

(i) Answer ANY FIVE questions.

(ii) Each question carries SEVEN marks.

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

19. Show that the product of the perpendicular distances from a point (α, β) to the pair of straight lines $ax^2 + 2hxy + by^2 = 0$ is $\frac{|a\alpha^2+2h\alpha\beta+b\beta^2|}{\sqrt{(a-b)^2+4h^2}}$.

20. Show that the lines joining the origin to the points of intersection of the curve $x^2 - xy + y^2 + 3x + 3y - 2 = 0$ and the straight line $x - y + \sqrt{2} = 0$ are mutually perpendicular.

21. Find the direction cosines of two lines which are connected by the relations $l + m + n = 0$ and $mn - 2nl - 2lm = 0$.

22. If $y = \tan^{-1}\left(\frac{2x}{1-x^2}\right) + \tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right) - \tan^{-1}\left(\frac{4x-4x^3}{1-6x^2+x^4}\right)$, then prove that $\frac{dy}{dx} = \frac{1}{1+x^2}$.

23. Find the angle between the curve $x^2y = 4$; $y(x^2 + 4) = 8$.

24. If the tangent at any point P on the curve $x^m y^n = a^{m+n}$ $(mn \neq 0)$ meets the coordinate axes in A, B, then show that AP : BP is a constant.
