MODEL QUESTION PAPER

MATHEMATICS PAPER - I (B)

(Calculus and Co-ordinate Gemetry)

English Version

Time: 3 Hours — Max. Marks. 75

Note: Question paper consists of three sections A, B and C.

Section - A

(Very short answer type questions)

Attempt all questions : — 10x2=20 marks

Each question carries two marks. ,

01. Write the condition that the equation ax+by+c=0 represents a non-vertical straight line. Also write its slope.

02. Transform the equation 4x-3y+ 12=0 into slope-intercept form and intercept form of a straight line.

03. Find the ratio in which the point C (6,-17,-4) divides the line segment joining the points A(2,3,4) and B(3,-2,2)

04. Evaluate $\underset{x \to 0}{\text{Lt}} \dfrac{3x - 1}{\sqrt{l + x} - 1)}$

05. Evaluate $\underset{x \to \infty}{\text{Lt}} \left(\sqrt{x+1} - \sqrt{x} \right)$

06. Find the constant ‘a’ so that the function f given by

$f(x)$ = sin x if x $\leq$ O

= x^2 + a if 0 < n < 1 is continous at x= O

07. Find the derivative of $\log_{10}x$ w.r.t x

08. If$Z = e^{ax}$ sinby then find Z_{ny}.

09. If $y = x^2 + 3x + 6$, x = 10, $\Delta x = 0.01$, then find Δy and dy.

10. Find the interval in which $f(x) = x^3 - 3x^2$ is decreasing.

Section - B

(Short answer type questions)

Attempt any <u>five</u> questions. Each question carries Four marks

5x4=20 marks

11. Find the equation of locus of a point, the sum of whose distances from (0, 2) and (0, -2) is 6 units

12. Show that the axes are to be rotated through an angle of $\frac{1}{2} \text{Tan}^{-1}\left(\frac{2h}{a-b}\right)$ so as to remove the xy term from the equation $ax^r + 2hxy + by^r = 0$ If a $\neq$ b and through the angle $\frac{\pi}{4}$, if a = b

13. Show that the origin is within the triangle whose angular points are (2,1), (3, -2) and (-4, 1)

14. Show that the line joining the points A (+6, -7, 0) and BC (16, -19, -4) intersects the line joining the points P(0,3,-6) and Q (2,-5, 10) at the point (1,-1,2)

15. Find the derivative of tan 2x from the first principles

16. A point P is moving with uniform velocity ‘V’ along a straight line AB. θ is a point on the perpendicular to AB at A and at a distance ‘l’ from it. Show that the angular velocity of P about θ is

17. State and prove the Eulers theorem on homogeneous functions.

SECTION - C

5 x 7 = 35 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 $ax^2 + 2\gamma xy + by^2 = 0$ and $lx+my+n = 0$ is $\dfrac{n^2 \sqrt{h^2 - ab}}{am^2 - 2\gamma ln + bl^2}$

20. Find the angle between the lines joining the origin to the points of intersection of the curve

$x^2 + 2xy + y^2 + 2x + 2y - 5 = 0$ and the line $3x - y + 1 = 0$

21. If a ray makes angle α, β, γ, and δ with the four diagonals of a cube, show that

$\cos^2\alpha + \cos^2\beta \cos^2\gamma + \cos^2\delta = \frac{4}{3}$

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

23. Show that the semi-vertical angle of the right circular cone of a maximum volume and of given slant height is $\text{Tan}^{-1}\sqrt{2}$

24. If the tangent at any point on the curve $x^{2/3} + y^{2/3} = a^{2/3}$

intersects the co-ordinate axis in A,B, then show that the length AB is constant.