

Section-A**I. Very Short Answer Questions. Answer all Questions.****Each Question carries 'Two' marks****10x2=20M**

1. Find the equation of the straight line whose distance from the origin is 4, if the normal ray from the origin to the straight line makes an angle of 135° with the positive direction of the X-axis.
2. Find the value of k, if the angle between the straight lines $4x - y + 7 = 0$ and $kx - 5y - 9 = 0$ is 45° .
3. Find the in centre of the triangle formed by the points $(0,0,0)$, $(3,0,0)$ and $(0,4,0)$.
4. Find the equation to the plane parallel to ZX - plane and passing through $(0,4,4)$.
5. Compute $\lim_{x \rightarrow 0} \frac{\sin \pi \cos^2 x}{x^2}$
6. Compute $\lim_{x \rightarrow \infty} \frac{11x^3 - 3x + 4}{13x^3 - 5x^2 - 7}$
- 7) If $f(x) = 7^{x^3+3x}$ $x > 0$ then find $f'(x)$
- 8) If $y = ae^{mx} + be^{-nx}$ then prove that $y'' = n^2 y$
- 9) Find dy and δy of $y = f(x) = x^2 + x$ at $x = 10$ when $\delta x = 0.1$
- 10) Verify the Roll's theorem for $f(x) = x^2 + 3e^{-x/2}$ in $[-3,0]$

Section-B**II. Short Answer Questions. Answer any 'Five' Questions.****Each Question carries 'Four' marks.****5 x4 =20 M**

- 11) If A(2,3) and B(-3,4) are two points. Find the locus of P so that the area of triangle PAB is 8.5 sq units.
- 12) When the axis are rotated through an angle $\frac{\pi}{6}$. Find the transformed equation of $x^2 + 2\sqrt{3}xy - y^2 = 2a^2$
13. Find the orthocenter of the triangle whose vertices are $(-5,-7)$, $(13,2)$ and $(-5,6)$.

14. Find real constants a, b so that the function f given by $f(x) = \begin{cases} \sin x & \text{if } x \leq 0 \\ x^2 + a & \text{if } 0 < x < 1 \\ bx + 3 & \text{if } 1 \leq x \leq 3 \\ -3 & \text{if } x > 3 \end{cases}$ is

continuous on \mathbb{R}

15. Find the derivative of $\sin 2x$ from the first principle.
 16. The volume of a cube is increasing at a rate of 9 cubic centimeters per second. How fast is the surface area increasing when the length of the edge is 10 centimeters?
 17. Show that the curves $y^2 = 4x + 1$ and $y^2 = 36 - 9x$ intersect orthogonally.

Section-C

III. Long Answer Questions. Answer any 'Five' Questions.

Each Question carries 'Seven' marks.

5 x 7 = 35 M

18. If $Q(h, k)$ is the foot of the perpendicular from $P(x_1, y_1)$ on the straight line $ax + by + c = 0$ then show that $h - x_1 : a = k - y_1 : b = -ax_1 + by_1 + c : a^2 + b^2$
19. Find the lines joining the origin to the points of intersection of the curve $7x^2 - 4xy + 8y^2 + 2x - 4y - 8 = 0$ with the line $3x - y - 2 = 0$ and also the angle between them
- 20) Show that the pair of lines $3x^2 + 8xy - 3y^2 = 0$ and $3x^2 + 8xy - 3y^2 + 2x - 4y - 1 = 0$ form a square
21. Find the angle between the lines whose direction cosines are given by the equations $3l + m + 5n = 0$ and $6mm - 2nl + 5lm = 0$.
22. If $y = \tan^{-1} \left[\frac{\sqrt{1+x^2} + \sqrt{1-x^2}}{\sqrt{1+x^2} - \sqrt{1-x^2}} \right]$ for $0 < |x| < 1$, find $\frac{dy}{dx}$.
23. If the tangent at any point on the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ intersects the coordinate axes in A and B, then show that the length AB is a constant.
- 24) If the curved surface of right circular cylinder inscribed in a sphere of radius r in maximum. Show that the height of cylinder is $\sqrt{2}r$