Time: 3Hrs   **Max.Marks:100**

SECTION-A

I.Answer the following questions: **10× 2 = 20**

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 $\lim\limits_{x \to 0} x^2 \sin\left(\frac{1}{x}\right)$.

6. Compute $\lim\limits_{x \to \infty} \frac{8|x|+3x}{3|x|-2x}$

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 $f: [-3, 8] \to$ R be defined by $f(x) = x^2 - 5x + 6$

SECTION-B

II.Answer Any Five of the following questions: **5× 4 = 20**

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

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 subtangents, 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 centimeters per second. How fast is the surface area increasing when the length of the edge is 10 centimetres?

SECTION –C

III.Answer Any Five of the following questions :   **5× 7 = 35**

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 $\left|\frac{n^2\sqrt{h^2-ab}}{am^2-2hlm+bl^2}\right|$
20. The condition for the line joining the orgin 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

$$mn - 2nl - 2lm = 0$$

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

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 permeter of the window is 20 ft. Find the maximum area.