SECTION - A

VERY SHORT ANSWER TYPE QUESTIONS $10 \times 2 = 20$

(Attempt 'ALL' questions. Each question carries '2' marks)

1. If the area of triangle formed by $x = 0, y = 0, 3x + 4y = a(a > 0)$ is 6 sq. units, find the value of 'a'.

2. If the lines $2x - 3y + k = 0, 3x - 4y - 13 = 0, 8x - 11y - 33 = 0$ are concurrent, find the value of 'k'.

3. Show that the points (1, 2, 3), (7, 0, 1) and (– 2, 3, 4) are collinear.

4. Find the equation of the plane passing through (2, 0, 1) and (3, – 3, 4) and perpendicular to $x - 2y + z = 6$.

5. Compute $\lim_{x \to 2} \dfrac{2x^2 - 7x - 4}{(2x - 1)(\sqrt{x} - 2)}$.

6. Compute $\lim_{x \to \infty} \dfrac{11x^3 - 3x + 4}{13x^3 - 5x^2 - 7}$.

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

8. If $y = sec\,(\sqrt{\tan x})$, find $\dfrac{dy}{dx}$.

9. Find Δy, dy for the function $y = x^2 + x$, when $x = 10$ and $\Delta x = 0{\cdot}1$.

10. Find the equation of the tangent and normal to the curve $y = 5x^4$ at the point (1, 5).

SECTION - B

SHORT ANSWER TYPE QUESTIONS $5 \times 4 = 20$

(Attempt any 'FIVE' questions. Each question carries '4' 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. Find the transformed equation of $x \cos \alpha + y \sin \alpha = p$ when the axes are rotated through an angle α.

13. A straight line forms a triangle of area 24 sq. units with the co-ordinate axes. Find the equation of that straight line if it passes through (3, 4).

14. If $y = a\cos x + (b + 2x)\sin x$, then show that $y'' + y = 4\cos x$.

15. Find the derivative of $Tan^{-1}\dfrac{\sqrt{1+x^2}-1}{x}$ with respect to x.

16. A point is moving with uniform velocity 'v' along a straight line AB. O 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 O is $\dfrac{lv}{OP^2}$.

17. If $f = \log(x^2 + y^2)$ then show that $f_{xx} + f_{yy} = 0$.

SECTION - C

LONG ANSWER TYPE QUESTIONS $5 \times 7 = 35$

(Attempt any 'FIVE' questions. Each question carries '7' marks)

18. If $Q(h, k)$ is the foot of the perpendicular from $P(x_1, y_1)$ on the line $ax + by + c = 0$, then prove $\dfrac{h - x_1}{a} = \dfrac{k - y_1}{b} = \dfrac{-(ax_1 + by_1 + c)}{a^2 + b^2}$. Also find the foot of the perpendicular from $(-1, 3)$ on the line $5x - y = 18$.

19. Find the value of k, if the lines joining the origin with the points of the curve $2x^2 - 2xy + 3y^2 + 2x - y - 1 = 0$ and the line $x + 2y = k$ are perpendicular.

20. Show that the product of the perpendiculars drawn from the point (α, β) on the pair of the lines $ax^2 + 2hxy + by^2 = 0$ is $\dfrac{|a\alpha^2 + 2h\alpha\beta + b\beta^2|}{\sqrt{(a-b)^2 + 4h^2}}$.

21. If the relation between the direction cosines of any two lines are $l + m + n = 0$, $l^2 + m^2 - n^2 = 0$; find the angle between the lines.

22. If $y = Tan^{-1}\left[\dfrac{2x}{1-x^2}\right] + Tan^{-1}\left[\dfrac{3x - x^3}{1 - 3x^2}\right] - Tan^{-1}\left[\dfrac{4x - 4x^3}{1 - 6x^2 + x^4}\right]$, show that $\dfrac{dy}{dx} = (1 + x^2)^{-1}$.

23. Find the angle between the curves $y^2 = 4x$ and $x^2 + y^2 = 5$.

24. Find the absolute maximum value and the absolute minimum value of the function $f(x) = x + \sin 2x$ in $[0, 2\pi]$.