



Date: 02-05-2016

Dept. No.

Max. : 100 Marks

Time: 01:00-04:00

PART – A

Answer ALL questions

(10 x 2 = 20)

1. Write down the Leibnitz formula for n^{th} derivative of a product.
2. Write the formula for the polar subnormal and polar subtangent of a curve.
3. Define a saddle point.
4. Write the steps used in Lagrange's method of undetermined multipliers.
5. Write the Cartesian formula for center of curvature.
6. Define evolute of a curve.
7. Remove the fractional coefficients from the equation $x^3 + \frac{1}{2}x^2 + \frac{1}{3}x - 1 = 0$.
8. Form the equation one of whose roots is $2 + i\sqrt{3}$.
9. State Descarte's rule of signs for negative roots.
10. Is there a real root between 0 and 1 for the equation $x^3 + 6x - 2 = 0$? Justify.

PART – B

Answer any FIVE questions

(5 x 8 = 40)

11. If $y = a \cos(\log x) + b \sin(\log x)$, Prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2 + 1)y_n = 0$.
12. Find the angle of intersection of the cardioids $r = a(1 + \cos \theta)$ and $r = b(1 - \cos \theta)$.
13. Find the minimum values of $F = 4x^2 + 6xy + 9y^2 - 8x - 24y + 4$.
14. Find the radius of curvature at point $\left(\frac{a}{4}, \frac{a}{4}\right)$ to the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$.
15. Find the asymptotes of the curve $x^3 + 3x^2y - xy^2 - 3y^3 + x^2 - 2xy + 3y^2 + 4x + 7 = 0$.
16. If the roots of the equation $x^3 + px^2 + qx + r = 0$ are in A.P., Prove that $2p^3 - 9pq + 27r = 0$.
17. Diminish by 2 the roots of the equation $x^4 + x^3 - 3x^2 + 2x - 4 = 0$.
18. Discuss the nature of the roots of the equation $3x^5 - 2x^3 - 4x + 2 = 0$.

PART- C

Answer Any TWO Questions

(2 x 20 = 40)

19. a) If $y = \sin(m \sin^{-1} x)$, Prove that $(1-x^2)y_2 - xy_1 + m^2y = 0$ and
 $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} + (m^2 - n^2)y_n = 0$.

b) Using Lagrange's multipliers method find the minimum value of u if

$$u = a^3x^2 + b^3y^2 + c^3z^2 \text{ where } \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1. \quad (10 + 10)$$

20. a) Find the radius of curvature of the cardioid $r = a(1 - \cos \theta)$.

b) Show that the evolute of the parabola $y^2 = 4ax$ is $27ay^2 = 4(x - 2a)^3$. (8 + 12)

21. a) Solve the equation $x^4 - 5x^3 + 4x^2 - 8x - 8 = 0$ given that $1 - \sqrt{5}$ is a root.

b) Solve $6x^5 + 11x^4 - 33x^3 - 33x^2 + 11x + 6 = 0$. (8 + 12)

22. a) Find the sum of the fourth powers of the roots of $x^3 + 10x^2 + 4x + 5 = 0$.

b) Find the real root of $x^3 - 4x + 2 = 0$ correct to two places of decimals using Horner's method. (6 + 14)

\$\$\$\$\$\$