



Date: 06-11-2017
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

PART A

ANSWER ALL THE QUESTIONS

(10 * 2 = 20 marks)

1. Find the n^{th} derivative of $y = (ax + b)^m$.
2. Find the sub tangent to the curve $y^2 = 4ax$.
3. How to examine a function $f(x,y)$ is minimum?
4. State the Lagrange's method.
5. Write down Cartesian formula for the radius of curvature .
6. Prove that the (p-r) equation of the cardioid $r = a(1 - \cos\theta)$ is $p^2 = \frac{r^3}{2a}$.
7. Form a rational cubic equation which shall have for roots $1, 3 - \sqrt{-2}$.
8. Define reciprocal equation.
9. Define evolute.
10. Find the upper limit of the positive roots of the equation $x^4 - 2x^3 - 13x^2 + 38x - 24 = 0$.

PART B

ANSWER ANY FIVE QUESTIONS

(5 * 8 = 40 marks)

11. Find the n^{th} differential coefficient of $\cos x . \cos 2x . \cos 3x$.
12. Find the slope of the tangent with the initial line for the cardioid
 $r = a(1 - \cos\theta)$ at $\theta = \frac{\pi}{6}$.
13. If $u = a^3x^2 + b^3y^2 + c^3z^2$ where $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$, find the minimum value of u.
14. Show that the equation $x^5 - 6x^2 - 4x + 5 = 0$ cannot have more than one negative root, using Descartes' rule.
15. Find the asymptotes of the equation $y^3 - 6xy^2 + 11x^2y - 6x^3 + x + y = 0$.
16. Solve the equation $x^4 - 5x^3 + 4x^2 + 8x - 8 = 0$ of which one root is $1 - \sqrt{5}$.
17. Show that the roots of the equation $x^3 + px^2 + qx + r = 0$ are in arithmetical progression if
 $2p^3 - 9pq + 27r = 0$.
18. Diminish the roots of the equation $x^4 + 8x^3 + 2x^2 - 6x - 9 = 0$ by 3.

PART C

ANSWER ANY TWO QUESTIONS

(2 * 20 = 40 marks)

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

b) Find the angle of intersection of the cardioids $r = a(1 + \cos\theta)$ and $r = b(1 - \cos\theta)$.

(10+10)

20. Find the maximum and minimum value of the function $x^3 y^2 (6 - x - y)$.

21. a) Solve the reciprocal equation $6x^6 - 35x^5 + 56x^4 - 56x^2 + 35x - 6 = 0$.

b) Find the sum of the fifth power of the roots of the equation

$$x^6 + 5x^5 + x^4 + 2x^3 - 3x^2 + 8x + 6 = 0.$$

(10+10)

22. a) Solve the equation $81x^3 - 18x^2 - 36x + 8 = 0$ whose roots are in harmonic progression.

b) The equation $x^3 - 2x^2 - 3x - 4 = 0$ has a root between 3 and 4. Calculate it to two places of decimal using Horner's method.

(8+12)
