



Date: 10-05-2023

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

PART – A

Answer ALL the questions:

(10 × 2 = 20)

1. Give the formulae for subtangent and subnormal in cartesian form.
2. Find $\frac{dy}{dx}$ where $y = 2x + 5$.
3. Define saddle point.
4. If p and q are roots of the equation $2x^2 + 3x + 5 = 0$, then find $p + q$.
5. Frame the quadratic equation, one of whose roots is $1 + i$.
6. Define a row matrix.
7. Give an example of a symmetric matrix.
8. Find the general solution of the equation $y = xp + p^2$.
9. Determine the product of the roots of the equation $x^3 - 6x^2 + 11x - 6 = 0$.
10. Write the formula for trapezoidal rule.

PART – B

Answer any FIVE of the following:

(5 × 8 = 40)

11. Determine the eigen values of the matrix $\begin{pmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{pmatrix}$.
12. Diminish the roots of the equation $x^4 - 5x^3 + 7x^2 - 4x + 5 = 0$ by 2.
13. Determine the nature of the roots of the equation $3x^5 - 2x^3 - 4x + 2 = 0$.
14. Elaborately discuss the criteria for maxima and minima of a function.
15. Calculate the sum of the cubes of the roots of the equation $x^3 - 6x^2 + 11x - 6 = 0$.
16. Find the radius of curvature of the curve $xy^2 = a^3 - x^3$ at $(a, 0)$.
17. Solve the equation $(D^2 + 2D + 1)y = e^{-x} + 3$.
18. Solve the equation $x^3 - 27x + 54 = 0$ using Cardon's method.

PART – C

Answer any TWO of the following:

(2 × 20 = 40)

19. a) Verify Cayley-Hamilton theorem for the matrix $A = \begin{pmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{pmatrix}$.

b) Separate $\sin(x + iy)$ into real and imaginary parts.

(10 + 10)

20. Find the evolute of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. (20)

21. a) Solve the equation $6x^5 + 11x^4 - 33x^3 - 33x^2 + 11x + 6 = 0$.

b) Solve the equation $(D^2 + 5D + 4)y = x^2 + 7x + 9$. (10 + 10)

22. a) If $u = \tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$, then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$.

b) Find by Newton-Raphson method, the real root of $x^3 - 2x - 5 = 0$ correct to three decimal places. (10+10)

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