

Code No: 51008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, June - 2022

MATHEMATICAL METHODS

(Common to EEE, ECE, CSE, IT)

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Reduce the matrix $A = \begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$ to its normal form and hence find the rank.
- b) Solve the system of equations $3x+y+2z=3$; $2x-3y-z=-3$, $x+2y+z=4$ using LU decomposition method. [7+8]

- 2.a) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 8 & -8 & 2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$. Hence, find A^{-1} .

- b) Diagonalize the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ [7+8]

- 3.a) Reduce the Quadratic form $2x^2+2y^2+2z^2-2xy+2xz-2yz$ to the canonical form by orthogonal reduction.

- b) Show that Eigen values of skew symmetric matrix are zero or purely imaginary. [10+5]

- 4.a) Find the real root of the equation $x \log_{10} x = 1.2$ using Bisection method.

- b) Find $y(2.4)$ using Newton's Backward difference formula from the table. [8+7]

X	1	1.4	1.8	2.2
Y	3.49	4.82	5.91	6.5

- 5.a) Fit the curve $y = ae^{bx}$ for the following data

x	2	3	4	5
y	1.05	2.10	3.85	8.30

- b) Evaluate $\int_1^2 \frac{e^{-x}}{x} dx$ using Trapezoidal rule. [8+7]

- 6.a) Find $y(0.1)$ using Euler's modified formula. If $\frac{dy}{dx} = 2e^x y$, $y(0)=2$.

- b) Evaluate $y(0.1)$, $y(0.2)$ by Taylor's Series method given that $y' = x + y^2$, $y(0)=1$. [8+7]

7.a) Find the Half range cosine series for $f(x) = \begin{cases} 1 & 0 < x < \frac{\pi}{2} \\ -1 & \frac{\pi}{2} < x < \pi \end{cases}$

b) Find the Fourier series for $f(x) = x^2$ in $-1 < x < 1$. [7+8]

8.a) Solve the Partial Differential Equation $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$.

b) Solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x, 0) = 6e^{-3x}$ by the method of separation of variables. [8+7]

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