Code No: 51008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, September/October - 2021
MATHEMATICAL METHODS
(Common to EEE, ECE, CSE, IT)

Time: 3 Hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
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1.a) Solve the following system of equations:
$4x + 2y + z + 3w = 0$
$6x + 3y + 4z + 7w = 0$
$2x + y + w = 0.$

b) Reduce the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}$ to its normal form and find its rank.   [7+8]

2. Verify Cayley-Hamilton theorem and hence find A^{-1} where $A = \begin{bmatrix} 8 & -12 & 5 \\ 15 & -12 & 11 \\ 24 & -42 & 19 \end{bmatrix}$.   [15]

3.a) Define: i) Hermitian Matrix ii) Skew – Hermitian matrix   iii) Unitary matrix.
b) Prove that the Eigen values of a unitary matrix are of unit modulus.   [7+8]

4.a) Find a real root of $f(x) = x^3 - 4x - 9 = 0$ by bisection method.
b) The following data give the melting point of an alloy of lead and zinc. 'ϕ' is the temperature in degrees centigrade, x is percent of lead.

x:	40	50	60	70	80	90
θ:	184	204	226	250	276	304

Find θ when $x = 43$ and when $x = 84$ by using Newton's forward formula.   [7+8]

5.a) Fit a straight line to the following data:

x:	4	6	8	10	12
y:	13.72	12.9	12.01	11.14	10.31

b) Evaluate $\int_0^{\pi/2} e^{\sin x} \, dx$ by Simpson's 3/8 rule by taking $h = \frac{\pi}{6}$.   [7+8]

6. Evaluate y(1.1) and y(1.2) using Runge-Kutta method of order four for the initial value problem $\frac{dy}{dx} = x^2 + y^2$, $y(1) = 0$.   [15]

7.a) Find the half – range sine series for $f(x) = e^x$ in $0 < x < 1$.
b) Find the Fourier series for the expansion of $f(x) = x^2$ in $-\pi < x < \pi$ [7+8]

8.a) Form the partial differential equation by eliminating ϕ from $xyz = \phi(x + y + z)$.
b) Solve $(mz - ny)dx + (nx - lz)dy = ly - mx.$ [7+8]

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