Code No: 131AA **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, June - 2022
MATHEMATICS - I
(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, MMT, AE, MIE, PTM, MSNT)
Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) A body is originally at 80 ^{0}C and cools down to 60 ^{0}C in 20 minutes. If the temperature of the air is 40 ^{0}C, find the temperature of the body after 40 minutes.

b) Solve the Differential Equation $\left(D^2+1\right)y=\sin x\sin 2x+e^x x^2$. [7+8]

2.a) Solve for the current i(t) in RL circuit if R = 2 ohms, L = 25 henries and $E(t) = Ae^{-t}$ with $A > 0$ and $i(0) = 0$.

b) Solve the Differential Equation $(D^2 + 4)\, y = 4\tan 2x$ by the method of variation of parameters. [7+8]

3.a) Find the rank of $\begin{bmatrix} 2 & -4 & 3 & -1 & 0 \\ 1 & -2 & -1 & -4 & 2 \\ 0 & 1 & -1 & 3 & 1 \\ 4 & -7 & 4 & -4 & 5 \end{bmatrix}$ using Echelon form.

b) Solve the following system of equations
$x+y-2z+3w=0,\ x-2y+z-w=0,\ 4x+y-5z+8w=0,\ 5x-7y+2z-w=0.$ [7+8]

4.a) Solve the following system of equations by Gauss-seidal method.
$5x+y+z+w=4,\ x+7y+z+w=12,\ x+y+6z+w=-5,\ x+y+z+4w=-6.$

b) Solve the following system of equations by LU decomposition method.
$x+y+z=6,\ x+2y+3z=14,\ x+4y+9z=36.$ [8+7]

5.a) If $A=\begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ Verify Cayley Hamilton theorem. Hence find A^4.

b) Prove that the matrix A and A^T have same Eigen values. [8+7]

6. Find Rank index and signature of quadratic $7x^2+6y^2+5z^2-4xy-4yz$ form by reduce into normal form by orthogonal reduction. [15]

7.a) Find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$ using Euler's theorem for $u=\log\left(\frac{x^2+y^2}{xy}\right)$.

b) Find the minimum values of the following function using Lagrange's multiplier method.
$x+y+z$ subject to $\frac{a}{x}+\frac{b}{y}+\frac{c}{z}=1$. [7+8]

8.a) Solve the Partial Differential Equation $p^3+q^3=pqz$.

b) Solve the Partial Differential Equation $yp-xq=-xe^{x^2+y^2}$. [7+8]

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