Code No: 131AA **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, September/October - 2021

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) Solve $\left(y\left(1+\frac{1}{x}\right)+\cos y\right)dx+\left(x+\log x-x\sin y\right)dy=0$

b) Solve $y''-2y'+2y=x+e^{x}\cos x$ [8+7]

2.a) Solve by the method of variation of parameters $y''-6y'+9y=\frac{e^{3x}}{x^{2}}$.

b) Uranium disintegrates at a rate proportional to the amount then present at any instant. If M_1 and M_2 grams of uranium are present at times T_1 and T_2 respectively, find the half-life of uranium. [8+7]

3.a) Find the value of K such that the rank of $A=\begin{bmatrix}1 & 2 & 3\\ 2 & K & 7\\ 3 & 6 & 10\end{bmatrix}$ is 2.

b) Show that the only real and value of λ for which the following equations have non- trivial solution is 6 and solve them when $\lambda=6$

$x+2y+3z=\lambda x, 3x+y+2z=\lambda y, 2x+3y+z=\lambda z$ [7+8]

4.a) Reduce the matrix A to its normal form where $A=\begin{bmatrix}0 & 1 & 2 & -2\\ 4 & 0 & 2 & 6\\ 2 & 1 & 3 & 1\end{bmatrix}$ and find its rank.

b) Solve the following system of equations by Gauss elimination method:

$2x_1+x_2+4x_3=12,\ 8x_1-3x_2+2x_3=20,\ 4x_1+11x_2-x_3=33.$ [7+8]

5.a) Find the Eigen values and the corresponding Eigen vectors of the matrix

$$A=\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}$$

b) Find the nature of the quadratic form, index and signature of

$10x^2+2y^2+5z^2-4xy+6yz-10xz$ by reducing to the canonical form. [7+8]

6.a) Determine the Eigen values of the matrix A^{-1} where $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 3 & 3 \end{bmatrix}$. Also, find the Corresponding Eigen vectors of A.

b) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$. Find A^{-1}. [8+7]

7.a) If $x+y+z=u,\ y+z=uv,\ z=uvw$. Then evaluate $\dfrac{\partial(x,y,z)}{\partial(u,v,w)}$

b) Find the shortest distance from origin to the surface $xyz^2 = 2$. [7+8]

8.a) Form the partial differential equation from $z = ax^3 + by^3$ by eliminating a and b.

b) Find the general solution of $y^2zp + x^2zq = y^2x$. [7+8]

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