**R16**

**Code No: 131AA**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B.Tech I Year I Semester Examinations, October/November - 2020**
**MATHEMATICS-I**
**(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, MMT, AE, MIE, PTM, CEE, MSNT)**

**Time: 2 hours** **Max. Marks: 75**

**Answer any five questions**
**All questions carry equal marks**

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1.a) Uranium disintegrates at a rate Proportional to the amount then present at any instant. If M1 and M2 grams of uranium are present at times $T_1$ and $T_2$ respectively, find the half-life of uranium.

b) Solve $\frac{d^2x}{dt^2} + \frac{dx}{dt} + x = \sin t + t^2$ . [7+8]

2.a) Solve: $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = x\,e^x \sin x$ .

b) Find the orthogonal trajectories of each of the following curve, $r = a\,(1 + cos\theta)$. [8+7]

3. Solve the system by Gaussian Elimination Method

$$2x_1 + 5x_2 + 2x_3 - 3x_4 = 3$$
$$3x_1 + 6x_2 + 5x_3 + 2x_4 = 2$$
$$4x_1 + 5x_2 + 14x_3 + 14x_4 = 11$$
$$5x_1 + 10x_2 + 8x_3 + 4x_4 = 4$$ [15]

4.a) Express $A = \begin{pmatrix} 2-3i & i \\ 0 & 4+5i \end{pmatrix}$ as the sum of a Hermitian matrix and a skew- Hermitian matrix .

b) Reduce to normal form the following matrix $A = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{pmatrix}$ [7+8]

5. Find the Eigen values and Eigenvectors of matrix A $= \begin{pmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{pmatrix}$. Find $B^{-1}AB$ Where $B = [\bar{b}_1\ \bar{b}_2\ \bar{b}_3]$ , $\bar{b}_1, \bar{b}_2, \bar{b}_3$ are Eigen vectors of A. [15]

6.a) Find the nature , index and signature of quadratic form $Q = 2x_1x_2 + 2x_1x_3 + 2x_2x_3$ .

b) Reduce the following matrix A into a diagonal matrix $A = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$. [8+7]

7.a) Find the total differential coefficient of $x^2y$ with respect to x when x , y are related by $x^2 + xy + y^2 = 1$.

b) If $u = e^{xyz}$ find the value of $\frac{\partial^3 u}{\partial x \partial y \partial z}$ . [8+7]

8.a) Solve : $\frac{y^2z}{x}p + xzq = y^2$.

b) Solve: $p = -x$ . [8+7]

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