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 $A = \begin{matrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{matrix}$ [7+8]

5. Find the Eigen values and Eigenvectors of matrix A $= \begin{matrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{matrix}$. Find $B^{-1}AB$ Where $B = \begin{matrix} b_1 & b_2 & b_3 \end{matrix}$, b_1, b_2, 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 $A = \begin{matrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{matrix}$. [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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