JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, May/June - 2019
MATHEMATICAL METHODS
(Common to EEE, ECE, CSE, BME, IT)

Time: 3 hours   **Max. Marks: 75**

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

1.a)   Reduce the Matrix A to its normal form

Where $A = \begin{bmatrix} 2 & -1 & 3 & 4 \\ 0 & 3 & 4 & 1 \\ 2 & 3 & 7 & 5 \\ 2 & 5 & 11 & 6 \end{bmatrix}$ and hence find the rank.

   b)   Show that the system of equations x + y + z = 6, x + 2y + 3z = 14, x + 4y + 7z =30 is consistent and solve them.   [7+8]

2.a)   If $\lambda_1, \lambda_2, \lambda_3 .... \lambda_n$ are Eigen values of a square matrix A then prove that $K\lambda_1, K\lambda_2, K\lambda_3 .... K\lambda_n$ are Eigen values of KA.

   b)   Find the Eigen values and the corresponding Eigen vectors of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.   [6+9]

3.   Identify the nature of the quadratic form $-3x^2 - 3y^2 - 3z^2 - 2xy - 2xz + 2yz$ and reduce it to canonical form by orthogonal reduction.   [15]

4.a)   Find a root of the equation $f(x) = x + \log x - 2$ using Newton Raphson method.

   b)   Using Newton's forward interpolation formula find the value of $f(1.6)$ if

x	1	1.4	1.8	2.2
y	3.49	4.82	5.96	6.5

[7+8]

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

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

   b)   Evaluate $\int_0^\pi \sin x \, dx$ by dividing the range into 10 equal parts using

i) Trapezoidal rule,   ii) Simpson's $\frac{1}{3}$ rd rule.   [7+8]

6. Using Runge Kutta method of fourth order find y(0.2), y(0.4) and y(0.6) given $\frac{dy}{dx} = y - x$, y(0) = 2 taking h = 0.2. [15]

7.a) Find a Fourier series to represent f(x) $= x^2$, in (- π, π). Hence show that
$$\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + ...$$

b) Find the half range cosine series for f(x) = Kx in (0, 5). [7+8]

8. Solve the following partial differential equations:
a) $\frac{x^2}{p} + \frac{y^2}{q} = z$
b) $x^2 p + y^2 q = z^2$. [7+8]

---ooOoo---