Code No: R10206 **R10** **SET-1**

I B. Tech II Semester Supplementary Examinations, Nov/Dec - 2019
MATHEMATICAL METHODS
(Com. to ECE, IT, ME, CHEM, BME, E Com E, PCE, PT & MM)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Find the rank of the matrix by reducing it to normal form $\begin{bmatrix} 1 & 2 & 3 & 2 \\ 3 & 2 & 3 & 5 \\ 3 & 6 & 9 & 6 \\ -1 & 1 & -2 & -2 \end{bmatrix}$. (8M)

   b) Solve the system of equations x + 2y + 3z = 1, 2x + 3y + 8z = 2, x + y + z = 3 using Gauss elimination method. (7M)

2. a) Find the eigen values and the corresponding eigen vectors of $\begin{bmatrix} 1 & 1 & 1 \\ -1 & -3 & -3 \\ 2 & 4 & 4 \end{bmatrix}$. (8M)

   b) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ and find A^{-1}. (7M)

3. Reduce the quadratic form $4x^2 + 3y^2 + z^2 - 8xy - 6yz + 4zx$ to canonical form using orthogonal transformation. Also find signature and rank of the quadratic form. (15M)

4. a) Find the root of $x - \cos x = 0$ using bisection method. (8M)

   b) Find an approximate root of the equation $xe^x - cos\ x = 0$ using Newton-Raphson method. (7M)

5. a) Construct difference table for the following data. (8M)

x	0.1	0.3	0.5	0.7	0.9	1.1	1.3
f(x)	0.003	0.067	0.148	0.248	0.370	0.518	0.697

   Evaluate f (0.6).

   b) Prove that (i) $\Delta\nabla = \Delta - \nabla$ (ii) $\frac{\Delta}{\nabla} - \frac{\nabla}{\Delta} = \Delta + \nabla$ (7M)

6. a) The population of a certain town is shown in the following table: (8M)

Year	1951	1961	1971	1981	1991
Population	19.96	39.65	58.81	77.21	94.61

   Estimate the rate of growth of the population in the year 1981.

   b) Evaluate $\int_0^{1.2} \sqrt{1+x^3}\,dx$ using Simpson's 3/8 rule. (7M)
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7. a) Use Range – Kutta method of order four to find $y(0.2)$ given that $y^1 = 3x + \frac{y}{2}, y(0)=1$. (8M)

   b) Using Milne's method, find $y(4.5)$ given $5xy^1 + y^2 - 2 = 0$ given $y(4) = 1$, $y(4.1) = 1.0049$, $y(4.2) = 1.0097$, $y(4.3) = 1.0143$ and $y(4.4) = 1.0187$. (7M)

8. Fit a least square curve of the form $y = ab^x$ for the following data. (15M)

X	0.1	0.2	0.3	0.4	0.7	1.0
y	2.4	2.9	3.7	4.1	7.8	11.2