R10

SET-1

I B. Tech II Semester Supplementary Examinations, April/May - 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 $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ using echelon form. (8M)

   b) Using Gauss elimination method, solve x – y + 2z = 4, 3x + y + 4z = 6, x + y + z = 1. (7M)

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

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

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

4. a) Find a positive root of $x^3 - x - 1 = 0$ correct to 3 decimal places by bisection method. (8M)

   b) Find an approximate root of the equation (x-1)sin x –x=1 using Newton-Raphson method. (7M)

5. a) Find f(2.5) using Newton's forward formula from the following table: (8M)

x	0	1	2	3	4	5	6
y	0	1	16	81	256	625	1296

   b) Prove that $\Delta \tan^{-1}\left(\dfrac{n-1}{n}\right) = \tan^{-1}\left(\dfrac{1}{2n^2}\right)$. (7M)

6. a) The velocity v of a particle moving in a straight line covers a distance x in time t. Find $f'(15)$, given the following data. (8M)

x	0	10	20	30	40
t	45	60	65	54	42

   b) Evaluate $\displaystyle\int_0^{0.6} \sqrt{1+x^4}\,dx$ using Simpson's 3/8 rule. (7M)

7. a) Using Runge-kutta method of second order to find y when $x = 0.3$ in steps of 0.1, given that $\dfrac{dy}{dx} = \dfrac{1}{2}(1+x)y^2$, y(0) = 1. (8M)

   b) Use Milne's method to find y(0.3) from $y' = x^2 + y^2$, y(0) = 1. Find the initial values y(-0.1), y(0.1) and y(0.2) from Taylor's series method. (7M)

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

x	1	2	3	4	7	10
y	3	7	9	12	14	18