Code No: **R201201** **R20** **SET - 1**

I B. Tech II Semester Supplementary Examinations, Jan/Feb-2024
MATHEMATICS-II
(Common to All Branches)

Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

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UNIT - I

1. a) Find the Rank of the matrix $\begin{bmatrix} 1 & 1 & -1 & 2 \\ 2 & 4 & 6 & 4 \\ 1 & 2 & 3 & 2 \end{bmatrix}$ by reducing it into normal form. [7M]

   b) Apply Gauss Elimination method to Solve the system of equations [7M]
   $2x + y + 2z + w = 6, \quad 6x - 6y + 6z + 12w = 36,$
   $4x + 3y + 3z - 3w = -1, \quad 2x + 2y - z + w = 10$

(OR)

2. a) Test for consistency and solve the system of equations [7M]
   $5x + 3y + 7z = 4, \ 3x + 26y + 2z = 9, \ 7x + 2y + 10z = 5.$

   b) Write Eigen values and Eigenvectors of the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$. Hence find Eigen values of A^2 and A^{-1}. [7M]

UNIT - II

3. a) Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2zx$ to canonical form by orthogonal transformation and hence find rank, index, signature and nature of the quadratic form [7M]

   b) Verify Cayley-Hamilton theorem for the matrix A and hence find A^{-1} if [7M]
   A= $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$.

(OR)

4. a) Find A^{-1} and A^4 using Cayley-Hamilton theorem where A=$\begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & 2 \\ 2 & -2 & 1 \end{bmatrix}$. [7M]

   b) Determine orthogonal matrix that will diagonalize the real symmetric matrix [7M]
   $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 1 \\ 0 & 0 & 2 \end{bmatrix}$ Also find the resulting diagonal matrix.

UNIT - III

5. a) Find a real root of the equation $x \log_{10} x = 1.2$. Which lies between 2 and 3 by bisection method? [7M]

   b) Solve the system of equations by using Gauss-Jacobi method $2x + y + z = 10$, [7M]
   $3x + 2y + 3z = 18, \ x + 4y + 9z = 16$ correct to two decimal places

(OR)

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6. a) Find real root of $e^x sinx = 1$ using Regula Falsi method. [7M]

   b) Solve the system of equations by using Gauss-Seidel method [7M]
   $10x - 2y - z - w = 3,\ -2x + 10y - z - w = 15,\ -x - y + 10z - 2w = 27,$
   $-x - y - 2z + 10w = -9$

UNIT – IV

7. a) Find missing term in the table [7M]

x	2	3	4	5	6
y	45	49.2	54.1	--	67.4

   b) Find the polynomial *f(x)* by using Lagrange's interpolation formula and hence find *f(3)* for [7M]

x	0	1	2	5
f(x)	2	3	12	147

(OR)

8. a) For the following data estimate f(1.720) using Forward difference formula [7M]

x	1.6	1.8	2	2.2	2.4	2.6	2.8	3.0
f(x)	0.0495	0.0605	0.039	0.0903	0.1102	0.1346	0.1664	0.2009

   b) Find cubic polynomial which takes the following values and hence evaluate f (4). [7M]

x	0	1	2	3
f(x)	1	2	1	10

UNIT - V

9. a) Use the Trapezoidal rule to estimate the integral $\int_0^2 e^{-x^2}\,dx$ taking $h = 0.25$ [7M]

   b) Use Taylor's series method, find approximate value of y at $x = 0.2$ for the differential equation $y' - 2y = 3e^x,\ y(0) = 0$. Compare the numerical solution obtained with exact solution [7M]

(OR)

10 a) Evaluate correct to 4 decimal places by Simpson's 3/8th rule $\int_0^{\frac{\pi}{2}} e^{sinx}\,dx$ [7M]

   b) Use Runge-Kutta method of 4th order to find y at $x = 0.1$ given that $\frac{dy}{dx} = 3e^x + 2y$, $y(0) = 0$ taking $h = 0.1$ [7M]

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