

**I B. Tech I Semester Supplementary Examinations, November - 2020**  
**MATHEMATICS-II**

(Com. to CE, ME, Chem E, Auto E, Min E, Pet E, Agri E)

Time: 3 hours

Max. Marks: 75

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

1. a) Find the Rank of the matrix  $A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$  using Echelon form. (8M)

b) Solve the system of equations  $4x+2y+z+w=0$ ,  $6x+3y+4z+7w=0$ ,  $2x+y+w=0$ . (7M)

Or

2. a) Solve the equations  $2x - 6y + 8z = 24$ ,  $5x + 4y - 3z = 2$ ,  $3x + y + 2z = 16$  by Gauss-Elimination method. (8M)

b) Find the Eigen values and Eigen vectors of the matrix  $\begin{bmatrix} 1 & -6 & -4 \\ 0 & 4 & 2 \\ 0 & -6 & -3 \end{bmatrix}$  (7M)

3. a) Reduce the quadratic form  $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$  in to canonical form (8M) by orthogonal reduction hence find rank, index and signature

b) Verify Cayley Hamilton theorem for  $A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 1 \\ 2 & 3 & 1 \end{bmatrix}$ , hence compute  $A^{-1}$  (7M)

Or

4. a) Diagonalize the matrix  $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 1 \\ -4 & 4 & 3 \end{bmatrix}$  if possible (8M)

b) Find the Nature, Rank, index, signature of the quadratic form  $2x^2 + y^2 - 3z^2 + 12xy - 4xz - 8yz$  (7M)

5. a) Solve the system of equations  $10x+2y+z=9$ ,  $2x+20y-2z = -44$ ,  $-2x+3y+10z = 22$  by Gauss Seidal method (8M)

b) Find the real root of the equation using  $x^3-x^2-1=0$  Newton-Raphson method. (7M)

Or

6. a) Solve the equations  $5x + y + z + w = 4$ ,  $x + 7y + z + w = 12$ ,  $x + y + 6z + w = -5$ ,  $x + y + z + 4w = -6$  by Gauss-Jacobi method. (8M)

b) Find the real root of the equation  $3x = 1 + \cos x$  using Bisection method. (7M)

7. a) Estimate  $f(1.75)$  from the following table using Newton forward interpolation formula. (8M)

|   |       |       |       |       |
|---|-------|-------|-------|-------|
| X | 1.7   | 1.8   | 1.9   | 2.0   |
| Y | 5.474 | 6.050 | 6.686 | 7.389 |

- b) Evaluate  $y(7)$  from the following table using Lagrange's formula. (7M)

|   |   |     |     |   |     |
|---|---|-----|-----|---|-----|
| X | 1 | 3   | 5   | 6 | 8   |
| Y | 2 | 1.5 | 2.4 | 4 | 5.6 |

Or

8. a) Find  $y(2.5)$  using Gauss forward interpolation formula from the following data. (8M)

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

(7M)

- b) Find the  $y(4)$  for the following data using Newton's divided difference formula.

|   |     |     |     |     |
|---|-----|-----|-----|-----|
| x | 0   | 2   | 3   | 6   |
| y | 707 | 819 | 866 | 966 |

9. a) Find the solution of  $\frac{dy}{dx} = x - y$ ,  $y(0) = 1$  at  $x=0.1$  using modified Euler's method. (7M)

- b) Evaluate  $\int_0^1 \frac{dx}{1+x}$  using Trapezoidal and Simpson's  $1/3^{\text{rd}}$  Rules and compare with exact solution. (8M)

Or

10. a) Solve  $\frac{dy}{dx} = xy$  using R-K method of fourth order for  $x=0.2$  given  $y(1) = 1$ . (8M)

- b) Obtain Picard's expansion for  $\frac{dy}{dx} = x + y$ ,  $y(0) = 1$ , hence evaluate  $y(0.1)$ . (7M)