

I B. Tech I Semester Supplementary Examinations, July/August- 2021
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' by reducing it to normal form, where (7M)

$$A = \begin{bmatrix} 1 & 4 & 3 & -2 & 1 \\ -2 & -3 & -1 & 4 & 3 \\ -1 & 6 & 7 & 2 & 9 \\ -3 & 3 & 6 & 6 & 12 \end{bmatrix}$$

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

Or

2. a) Find the eigenvalues and eigen vectors of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. (10M)

- b) Prove that the eigenvalues of a real symmetric matrix are always real numbers. (5M)

3. Reduce the quadratic form $3x_1^2 + 3x_2^2 + 3x_3^2 + 2x_1x_2 + 2x_1x_3 - 2x_2x_3$ to canonical form using orthogonal transformation. Also find signature and rank of the quadratic form. (15M)

Or

4. a) 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} (9M)

- b) Find a singular value decomposition for the matrix $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$. (6M)

5. a) Using Regula-falsi method, find the real root of $2x - \log x = 6$ correct to three decimal places. (6M)

- b) Solve the system of equations $x + y + 54z = 110$; $27x + 6y - z = 85$; $6x + 15y + 2z = 72$ (9M)
 using Gauss Seidel method.

Or

6. a) Solve the system of equations by Newton Raphson method $x^2 + y^2 - 1 = 0$ and $y - x^2 = 0$. (9M)

- b) Find a real root of $3x = \cos x + 1$ using iteration method. (6M)

7. a) Fit a interpolating polynomial in x for the following data. (8M)

x	0	1	2	3	4
y	-3	3	4	27	57

- b) Using Lagrange's Interpolation formula find the value of $y(10)$ from the following table. (7M)

x	5	6	9	11
y(x)	12	13	14	16

Or

8. a) Find a polynomial by using Newton's divided difference formula for the data. (10M)

x	-2	0	1	3	6
f(x)	121	135	189	200	225

- b) If the interval of differencing is unity, prove that $\Delta \tan^{-1} \left[\frac{n-1}{n} \right] = \tan^{-1} \left[\frac{1}{2n^2} \right]$. (5M)

9. a) Evaluate $\int_0^1 \sqrt{1+x^4} dx$ using Simpson's 3/8 rule. (6M)

- b) Solve $y' = x - y^2$, $y(0) = 1$ using Taylor's series method and compute $y(0.1)$. (9M)

Or

10. a) Using Euler's method ,solve $y' = y^2 + x$; $y(0) = 1$, compute $y(0.1)$, $y(0.2)$. (6M)

- b) Using Runge-Kutta fourth order formula, find $y(0.2)$ for the equation $y' = \frac{y-x}{y+x}$ $y(0) = 1$. (9M)