

Reg No.: _____

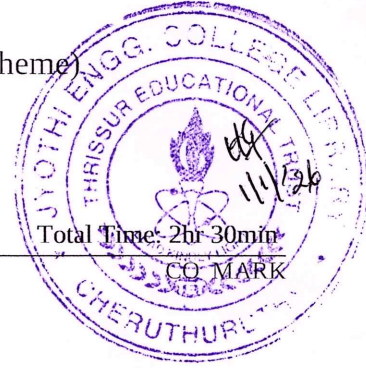
Name : _____



Jyothi Engineering College(Autonomous)

M.Tech Degree S1 (R) Examination, December 2025 (2025 Scheme)

25PADT102- MATHEMATICAL FOUNDATIONS FOR DATA SCIENCE



Total Mark: 60

Total Time: 2hr 30min
CO-MARK**PART A**

Answer All Questions

1. Find the Least Squares regression line for the data points $(-1, 1), (1, 0), (3, -3)$. CO1 (5)
2. Check whether the vectors $\begin{bmatrix} 1 \\ 1 \\ 3 \\ 3 \end{bmatrix}, \begin{bmatrix} -1 \\ 1 \\ -1 \\ -3 \end{bmatrix}, \begin{bmatrix} 2 \\ 5 \\ 9 \\ 6 \end{bmatrix}$ are linearly independent or not. CO2 (5)
3. Make use of parallel matrix method to find AB where $A = \begin{bmatrix} 2 & 1 & 5 & 3 \\ 0 & 7 & 1 & 6 \\ 9 & 2 & 4 & 4 \\ 3 & 6 & 7 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 1 & 2 & 3 \\ 4 & 5 & 6 & 5 \\ 1 & 9 & 8 & -8 \\ 4 & 0 & -8 & 5 \end{bmatrix}$ CO3 (5)
4. Verify Cauchy Schwarz Inequality for the vectors $U = \begin{bmatrix} -2 \\ 3 \\ 1 \end{bmatrix}$ and $V = \begin{bmatrix} 3 \\ -4 \\ -1 \end{bmatrix}$. CO4 (5)
5. Find the SVD of the matrix $A = \begin{bmatrix} 3 & 2 & 2 \\ 2 & 3 & -2 \end{bmatrix}$. CO5 (5)

PART B

Answer Any Five Question(s)

6. Compute the Orthogonal Projection of $b(5, 2)$ onto $a = \begin{bmatrix} -5 \\ 2 \end{bmatrix}$. CO1 (7)
7. Define the following types of matrices with an example CO2 (7)
 - i. Square matrix
 - ii. Rectangular matrix
 - iii. Symmetrix matrix
 - iv. Skew- symmetric matrix
 - v. Identity matrix.
8. Find the row space, column space and null space of $A = \begin{bmatrix} 1 & 1 & 5 & 1 \\ 2 & 4 & 14 & 4 \\ 2 & 3 & 12 & 3 \end{bmatrix}$. CO3 (7)
9. Construct an orthonormal basis using Gram Schmidt Process for a subspace of \mathbb{R}^4 with basis $S = (u_1, u_2, u_3)$ where $u_1 = (1, -2, 0, 1), u_2 = (-1, 0, 0, -1), u_3 = (1, 1, 0, 0)$. CO4 (7)
10. Determine the Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} 3 & 2 & 4 \\ 2 & 0 & 2 \\ 4 & 2 & 3 \end{bmatrix}$. CO5 (7)
11. Find the regression quadratic polynomial from the following points CO4 (7)
 $(1, 2), (2, 3), (3, 5), (4, 8)$.

12. Diagonalize the matrix $A = \begin{bmatrix} 4 & 2 & -2 \\ 2 & 5 & 0 \\ -2 & 0 & 3 \end{bmatrix}$.

CO5 (7)
