



PRESIDENCY UNIVERSITY

BENGALURU

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Mid - Term Examinations - March 2026

Date: 14-03-2026

Time: 02:00pm - 03:30pm

School: SOE	Program: B. Tech. in ECE		
Course Code: ECE3017	Course Name: Linear Algebra for Communication Engineering		
Semester: VI	Max Marks: 50	Weightage: 25%	

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	26	24				

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.

5Q x 2M=10M

1	Consider the following set of vectors in \mathbb{R}^3 : $S = \{(1, 0, 0), (0, 1, 0), (0, 0, 1)\}$. Classify whether S forms a basis for \mathbb{R}^3 . Defend your answer.	2 Marks	L3	CO2
2	A set of vectors in \mathbb{R}^3 is provided: $\begin{bmatrix} 2 & 1 & 0 \\ 1 & -1 & 3 \\ 0 & 4 & -3 \end{bmatrix}$ Describe whether the given vectors are linearly dependent or linearly independent. The row echelon form of the above matrix is: $\begin{bmatrix} 1 & -1 & 4 \\ 0 & 3 & -8 \\ 0 & 0 & 5 \end{bmatrix}$	2 Marks	L3	CO2

3	<p>A matrix C is provided for analysis:</p> $C = \begin{bmatrix} 6 & 4 \\ 3 & 2 \end{bmatrix}$ <p>a) Compute the determinant of C. b) Defend the claim that matrix C is singular without computing its inverse.</p>	2 Marks	L2	CO1
4	<p>The following matrix B is in row reduced echelon form.</p> $B = \begin{bmatrix} 1 & 2 & 0 & 0 & 4 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ <p>a) Locate the pivot positions. b) Locate the pivot columns. c) Compute the rank of the matrix.</p>	2 Marks	L2	CO1
5	<p>Consider the following matrices:</p> $A = \begin{bmatrix} 4 & -1 & 5 \\ 2 & 3 & 0 \\ -2 & 1 & 4 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 3 \\ -2 & 0 \\ 4 & 2 \end{bmatrix}$ <p>a) Compute the matrix product AB. b) Compute the transpose of the resulting product matrix, denoted as $(AB)^T$.</p>	2 Marks	L2	CO1

Part B

Answer the Questions.

Total Marks 40M

6.	<p>a. Consider the matrix</p> $A = \begin{bmatrix} 1 & 2 & -3 & 1 & 2 \\ 2 & 4 & -4 & 6 & 10 \\ 3 & 6 & -6 & 9 & 13 \end{bmatrix}$ <p>Solve for the row canonical form (reduced row echelon form) of matrix A.</p>	10 Marks	L3	CO2
	<p>b. Solve the following system of linear equations using LU factorization method:</p> $\begin{aligned} x+2y+3z+2w &= 1 \\ 4x+3y+z+w &= 2 \\ x+2y+3z &= 3 \end{aligned}$	10 Marks	L3	CO2
Or				

7.	a.	<p>Consider the matrix</p> $B = \begin{bmatrix} 1 & -2 & 3 & 1 & 2 \\ 1 & 1 & 4 & -1 & 3 \\ 2 & 5 & 9 & -2 & 8 \end{bmatrix}$ <p>Solve for the row canonical form of matrix A using the Gauss-Jordan method.</p>	10 Marks	L3	CO2
	b.	<p>Apply the LU factorization method to decompose the following matrix:</p> $A = \begin{bmatrix} 1 & 2 & 0 & 2 \\ 1 & 3 & 2 & 1 \\ 2 & 3 & 4 & 0 \end{bmatrix}$	10 Marks	L3	CO2

8.	a.	<p>Consider the matrix</p> $A = \begin{bmatrix} 1 & 2 & -3 & 1 & 2 \\ 2 & 4 & -4 & 6 & 10 \\ 3 & 6 & -6 & 9 & 13 \end{bmatrix}$ <p>Convert matrix A to an echelon form.</p>	10 Marks	L2	CO1
	b.	<p>Determine whether the vector</p> $\mathbf{u} = \begin{bmatrix} 5 \\ 3 \\ 13 \end{bmatrix}$ <p>is in the column space of the matrix</p> $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 2 & 3 & 4 \end{bmatrix}$ <p>The row echelon form of the above matrix is</p> $\text{ref}(A) = \left[\begin{array}{ccc c} 1 & 2 & 1 & 5 \\ 0 & 1 & -1 & 3 \\ 0 & 0 & 1 & 6 \end{array} \right]$	10 Marks	L2	CO1

Or

9.	a.	<p>Consider the matrix</p> $B = \begin{bmatrix} 1 & -2 & 3 & 1 & 2 \\ 1 & 1 & 4 & -1 & 3 \\ 2 & 5 & 9 & -2 & 8 \end{bmatrix}$ <p>Convert matrix A to an echelon form.</p>	10 Marks	L2	CO1
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	b.	Determine whether the vector $\vec{x} = \begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix}$ is in the null space of the matrix $E = \begin{bmatrix} 1 & 0 & -2 \\ 2 & 1 & -3 \\ 1 & 1 & -1 \end{bmatrix}$	10 Marks	L2	CO1
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