RV UNIVERSITY

USN:

RV University

School of Computer Science and Engineering

B.Tech Degree Examination-June 2025

Semester : **II**

Course Code : **CS1807**

Course Title : **Linear Algebra**

Duration : **2 Hours** **Max. Marks: 30**

Instructions to students:

- There are **3** pages in the question paper in two parts, **Part-A and Part-B.** Ensure that you have a complete set of question papers before answering.
- Write your **USN** number on the question paper as soon as you receive it.
- Do not write any part of the answers on the question papers.
- The number in square bracket [ ] at the end of each question indicates the marks for that question.
- ***Basic non-scientific calculators are allowed.***
- All questions are compulsory.

Sl. No.	PART A – Max Marks(10)	Marks	L1-L6	CO
1.	**a.** Determine whether the system of equations intersect at a common point, or coincide or are parallel, Justify. [3] $$x+y+z=2$$ $$2x+3y+z=5$$ $$3x+4y+2z=7$$ **b.** Determine the values of a for which system has a unique solution. [2] $$2x+y=5$$ $$4x+ay=b$$	5	L2	CO1
2.	Given the matrix A and vector b : $$A=\begin{bmatrix}1 & 0 & 2\\ 0 & 1 & -1\\ 2 & -1 & 5\end{bmatrix}, b=\begin{bmatrix}3\\1\\4\end{bmatrix}$$	5	L2	CO2

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	a. Is b∈Null(A)? **[1]** b. Is b∈Row(A)? **[2]** c. Is b∈Col(A)? **[2]**			

Sl. No.	PART B – Max Marks(20)	Marks	L1-L6	CO
3.	Let $T: R^2 \rightarrow R^2$ be the transformation defined by: $T(x,y) = (x+y, x-y)$ a. Determine whether T is a linear transformation. **[3]** b. Compute the inverse transformation T^{-1}, if it exists. **[3]** c. Obtain the eigenvalues of the matrix representation of T. **[1]** d. Compute the eigenvectors of the matrix representation of T. **[3]**	10	L3	CO3
4.	a. Compute the matrix associated with the quadratic form of $f(x,y,z) = xy + yz + zx$. **[2]** b. In $\mathbb{R}^3$, let P be the subspace generated by $(1,1,1)$ and $(3,-1,-1)$. Compute the orthogonal complement of P, denoted as $P^{\perp}$. **[3]** c. Compute the Singular Value Decomposition of A, given that the symmetric matrix A^tA has eigenvalues with 3 and 1, with corresponding eigenvectors $v_1 = [1,1]^t$, and $v_2 =$ $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 0 & 1 \end{bmatrix}$ $[-1,1]^t$ **[5]**	10	L3	CO4

Course Outcomes

1. Apply Gaussian elimination, LU decomposition and others to solve systems of linear equations.
2. Compute the span, basis and dimension of matrix subspaces to solve related problems in computer science.
3. Compute eigenvalues and eigenvectors of a given matrix to solve real world problems.
4. Apply orthogonal projections, Gram-Schmidt processes, and Singular Value Decomposition to solve approximation problems.

Marks Distribution									
L1	L2	L3	L4	L5	L6	CO1	CO2	CO3	CO4
-	10	20	-	-	-	5	5	10	10