SET 3

	USN:		
RV UNIVERSITY — Go, change the world — an initiative of RV EDUCATIONAL INSTITUTIONS	**School of Computer Science and Engineering** **B.Tech (Hons.)** **CIE-1** **Academic Year** 2024 – 2025		
Course: Linear Algebra	**Course Code:** CS1807	**Semester:** II	
Date: 13 March 2025	**Duration: 75 Minutes**	**Max Marks: 15 Marks**	

Instructions:

- All questions are compulsory.
- Do not answer any part of the answers in the question paper.
- Do not engage in any unfair practices.
- Non-programmable calculators are allowed.

S.No	Question	Marks	Level	CO
1	Determine the balanced chemical equation for $$C_3H_8 + O_2 \to CO_2 + H_2O$$ by using Gauss-Jordan elimination method.	3	L3	CO 1
2	Your class faculty is explaining a problem in a linear algebra session and presents the following 3×3 matrix: $$A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 0 \\ 0 & 1 & 2 \end{bmatrix}.$$ As a diligent and attentive student, assist your faculty in finding the inverse of matrix A using the Gauss-Jordan elimination method.	3	L3	CO 1
Continued on next page...				

3	A structural engineering simulation requires solving the following system of equations to determine the forces acting on a joint section of a bridge $$\begin{aligned} 5x - 2y + 3z &= -1 \\ -3x + 9y + 2z &= 2 \\ 2x - y + 7z &= 6 \end{aligned}$$ The engineer tells you to implement two iterations of the Gauss-Seidel method to approximate the solution to this system by considering the initial guess as $[x_1, x_2, x_3] = [0, 0, 0]$.	4	L3	CO 1
4	Determine whether the vectors $(5, -2, 4), (2, -3, 5)$ and $(4, -5, 7)$ are linearly independent or dependent in $\mathbb{R}^3$.	3	L3	CO 2
5	Determine whether W is a subspace of V, where $V = \mathbb{R}^3$ and $W = \left\{ \begin{bmatrix} a \\ b \\ c \end{bmatrix} \mid 2a - 5c = 11 \text{ and } a, b, c \in \mathbb{R} \right\}$.	2	L3	CO 2

Course Outcomes	
CO1:	Apply Gaussian elimination, LU decomposition and others to solve systems of linear equations.
CO2:	Compute the span, basis and dimension of matrix subspaces to solve related problems in computer science.
CO3:	Compute eigenvalues and eigenvectors of a given matrix to solve real world problems.
CO4:	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
-	-	15	-	-	-	10	5	-	-

End

SET 2

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Course: Linear Algebra	**Course Code:** CS1807	**Semester:** II
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Instructions:

- All questions are compulsory.
- Do not answer any part of the answers in the question paper.
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S.No	Question	Marks	Level	CO
1	Determine the balanced chemical equation for $$Al + HCl \rightarrow AlCl_3 + H_2$$ using Gauss-Jordan elimination method.	3	L3	CO 1
2	Your class faculty is explaining a problem in a linear algebra session and presents the following 3×3 matrix: $$A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 3 & 2 \\ 1 & 0 & 2 \end{bmatrix}.$$ As a diligent and attentive student, assist your faculty in finding the inverse of matrix A using the Gauss-Jordan elimination method.	3	L3	CO 1

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3	A heat transfer analysis in a metal rod requires solving the following system of equations to determine the temperature distribution at three key points along its length $$\begin{aligned} 4x - y + z &= 3 \\ x + 5y - 2z &= 3 \\ 2x - y + 4z &= 7 \end{aligned}$$ The analyst instructs you to perform two iterations of the Gauss Seidel method to approximate the solution to this system with an initial guess as $[x, y, z] = [0, 0, 0]$.	4	L3	CO 1
4	Determine whether the vectors $(1, 1, 1), (1, 2, 3)$ and $(2, 3, 8)$ are linearly independent or dependent in $\mathbb{R}^3$.	3	L3	CO 2
5	Determine whether W is a subspace of V, where $V = \mathbb{R}^3$ and $W = \left\{ \begin{bmatrix} a \\ b \\ c \end{bmatrix} \mid 3a + 4c = 7 \text{ and } a, b, c \in \mathbb{R} \right\}$.	2	L3	CO 2

Course Outcomes	
CO1:	Apply Gaussian elimination, LU decomposition and others to solve systems of linear equations.
CO2:	Compute the span, basis and dimension of matrix subspaces to solve related problems in computer science.
CO3:	Compute eigenvalues and eigenvectors of a given matrix to solve real world problems.
CO4:	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
-	-	15	-	-	-	10	5	-	-

End

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S.No	Question	Marks	Level	CO
1	Determine the balanced chemical equation for $$C_2H_6 + O_2 \to CO_2 + H_2O$$ using Gauss-Jordan elimination method.	3	L3	CO 1
2	Your class faculty is explaining a problem in a linear algebra session and presents the following 3×3 matrix: $$A = \begin{bmatrix} 1 & 0 & 1 \\ 3 & 1 & 0 \\ 4 & 6 & 1 \end{bmatrix}.$$ As a diligent and attentive student, assist your faculty in finding the inverse of matrix A using the Gauss-Jordan elimination method.	3	L3	CO 1
	Continued on next page...			

3	A structural engineering simulation requires solving the following system of equations to determine the forces acting on a joint section of a bridge $$\begin{aligned} 12x_1 - 7x_2 + 3x_3 &= 2 \\ x_1 + 5x_2 + x_3 &= -5 \\ 2x_1 + 7x_2 - 11x_3 &= 6 \end{aligned}$$ The engineer tells you to implement two iterations of the Gauss-Seidel method to approximate the solution to this system by considering the initial guess as $[x_1, x_2, x_3] = [0, 0, 0]$.	4	L3	CO 1
4	Determine whether the vectors $(1, -1, 2), (2, 0, 1)$ and $(-1, 2, -1)$ are linearly independent or dependent in $\mathbb{R}^3$.	3	L3	CO 2
5	Determine whether W is a subspace of V, where $V = \mathbb{R}^3$ and $W = \left\{ \begin{bmatrix} a \\ b \\ c \end{bmatrix} \mid c = a + b + 1 \text{ and } a, b, c \in \mathbb{R} \right\}$.	2	L3	CO 2

Course Outcomes	
CO1:	Apply Gaussian elimination, LU decomposition and others to solve systems of linear equations.
CO2:	Compute the span, basis and dimension of matrix subspaces to solve related problems in computer science.
CO3:	Compute eigenvalues and eigenvectors of a given matrix to solve real world problems.
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Marks Distribution

L1	L2	L3	L4	L5	L6	CO1	CO2	CO3	CO4
-	-	15	-	-	-	10	5	-	-

End