	Parul University **Faculty of Engineering and Technology** **Parul Institute of Engineering and Technology** **CSE/IT Department**

Subject Name	**Linear Algebra**	**A.Y**	**2025-2026**
Subject Code	**03019102BS01**	**Semester**	**II**

Assignment-2

Sr No	Question	COs	B.T	Competence
1.	Show that vectors $v_1 = (0,3,1,-1), v_2 = (6,0,5,1)$ and $v_3 = (4,-7,1,3)$ form linearly dependent in $\mathbb{R}^4$.	2	3	Apply
2.	Let $v_1 = (1,2,1), v_2 = (2,9,0)$ and $v_3 = (3,3,4)$. Show that the set $S = \{v_1, v_2, v_3\}$ is a basis for $\mathbb{R}^3$.	2	1	Remember
3.	Which of the following sets of vectors in R^3 are linearly independent? (i) $v_1 = (-3,0,4), v_2 = (5,-1,2)$ and $v_3 = (1,1,3)$. (ii) $v_1 = (-2,0,1), v_2 = (3,2,5)$ and $v_3 = (6,-1,1), v_4 = (7,0,-2)$. (iii) $(4,-1,2), (-4,10,2), (4,0,1)$.	2	4	Analyze
4.	Show that the set $S = \{v_1, v_2, v_3, v_4\}$ is a basis for the vector space M_{22} Where, $v_1 = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, v_2 = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, v_3 = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}, v_4 = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$	2	1	Remember
5.	(a) Write standard basis for the space of polynomials P_2 (the space of polynomials of degree at most 2). (b) Verify whether the set of all matrices of the form $\begin{bmatrix} a & b \\ 0 & c \end{bmatrix}$ is a subspace of the vector space of all 2×2 matrices. (c) Define linearly dependent vectors.	2	3	Apply
6.	Given the set $S = \{(1,0,0), (0,1,0), (1,1,0), (0,0,1)\}$in $\mathbb{R}^3$, find a minimal	3	4	Analyze

	spanning set for $\mathbb{R}^3$.			
7.	Let W be the set of all vectors in $\mathbb{R}^3$ defined by $W = \{(x, y, z) \in R^3 : 2x - y + 3z = 0\}$. Prove that W is a subspace of $\mathbb{R}^3$.	**2**	**4**	**Analyze**
8.	Let $W_1 = \{(x, y, z) \in R^3 : x - z = 0\}$ and $W_2 = \{(x, y, z) \in R^3 \vert y + z = 0\}$. Find the intersection $W_1 \cap W_2$ and verify that it is a subspace of R^3.	**2**	**4**	**Analyze**
9.	Determine the dimension and a basis for the solution space of the system. $x_1 + x_2 - 2x_3 = 0, \ -2x_1 - 2x_2 + 4x_3 = 0, \ -x_1 - x_2 + 2x_3 = 0$	**2**	**4**	**Analyze**
10.	Find a basis for the eigen space of the matrix $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$ and determine its dimension.	**2**	**4**	**Analyze**
11.	Let V be the set of all polynomials of degree at most 2, denoted by P_2. Check if the set $S = \{1, x, x^2\}$ is a spanning set for P_2. Give reason.	**2**	**4**	**Analyze**
12.	Check whether $V = R^2$ is a vector space with respect to $(x_1, y_1) + (x_2, y_2) = (x_1 + x_2 - 2, y_1 + y_2 - 3)$ and $k(x, y) = (kx + 2k - 2, ky - 3k + 3)$, k is a real number.	**2**	**3**	**Apply**
13.	Evaluate whether the set $S = \{(x, y) \in R^2 \ \vert x + y = 1\}$ is a subspace of $\mathbb{R}^2$.	**2**	**1**	**Remember**
14.	Determine whether the set $V = \{(a, b, 1) \vert a, b \in \mathbb{R}\}$ is a vector space over $\mathbb{R}$.	**2**	**3**	**Apply**
15.	Check if the set {(1, 2), (2, 4)} is linearly independent in $\mathbb{R}^2$. Justify your answer.	**2**	**3**	**Apply**
16.	Define the span of a set of vectors.	**2**	**4**	**Analyze**
17.	Determine the dimension of the subspace spanned by {(1, 0, 0), (0, 1, 0)} in $\mathbb{R}^3$.	**2**	**5**	**Create**
18.	Find a basis for the subspace of $\mathbb{R}^4$ spanned by (1, 0, 0, 0), (0, 1, 0, 0), and (1, 1, 0, 0).	**2**	**3**	**Apply**
19.	Find the basis vectors for the eigenspace of a given matrix to determine its geometric multiplicity.	**2**	**1**	**Remember**
20.	Prove that an $n \times n$ matrix A is diagonalizable if and only if A has n linearly independent eigenvectors.	**2**	**1**	**Remember**