Parul University
Faculty of Engineering & Technology
Department of Applied Sciences and Humanities
B. Tech Programme Sem-2(CSE(All Branches), IT)
Linear Algebra (03019102BS01)
Unit–1 Matrices (Tutorial-1)

Q-1.	Identify if the following matrices are Symmetric, skew symmetric or not. (a) $\begin{bmatrix} 0 & 2 & 3 \\ -2 & 0 & -4 \\ -3 & 4 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$
Q-2.	Identify if the following matrices are orthogonal or not. (a) $\begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$ (b) $\frac{1}{7}\begin{bmatrix} 3 & 2 & 6 \\ -6 & 3 & 2 \\ 2 & 6 & -3 \end{bmatrix}$
Q-3.	Which of the following matrices are in row-echelon form, reduced-row echelon form, or both? Justify your answer with appropriate reasons. (a) $A = \begin{bmatrix} 2 & 2 & -1 \\ 5 & -1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$ (b) $B = \begin{bmatrix} 2 & 3 & -5 \\ 0 & 1 & -3 \\ -1 & -4 & 3 \end{bmatrix}$
Q-4.	Find Rank of the following matrices: (a) $A = \begin{bmatrix} 1 & 5 & 4 \\ 0 & 3 & 2 \\ 2 & 13 & 10 \end{bmatrix}$ (b) $B = \begin{bmatrix} 1 & 3 & 2 & 1 \\ 2 & 3 & 3 & 2 \\ 3 & 4 & -1 & 3 \\ 6 & 10 & 4 & 6 \end{bmatrix}$ (c) $C = \begin{bmatrix} 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \\ 9 & 10 & 11 & 12 \end{bmatrix}$
Q-5.	Solve the following systems of equations using Gauss elimination method. (a) $x - 2y + 2z = 3; 2x + y + 2z = 4; 6x + 2y - 2z = 4$ (b) $2x - y + z = 3; 3x - y + 2z = 6; -5x + 8y - 4z = 2$ (c) $x + 2y + z = 5; -x - y + z = 2; y + 3z = 1$
Q-6.	Solve the following systems of equations using LU-Decomposition method. (a) $x_1 + x_2 + x_3 = 3; 2x_1 - x_2 - x_3 = 3; x_1 - x_2 + x_3 = 9$ (b) $2x + 3y - z = 5; 3x + 2y + z = 10; x - 5y + 3z = 0$ (c) $x + 2y + 3z = 9; 4x + 5y + 6z = 24; 3x + y - 2z = 4$
Q-7.	Find the Eigen values and Eigen vector of the following matrices. Also determine algebraic multiplicity and geometric multiplicity of the matrices wherever possible. (a) $A = \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$ (b) $B = \begin{bmatrix} -3 & -7 & -5 \\ 2 & 4 & 3 \\ 1 & 2 & 2 \end{bmatrix}$ (c) $C = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ (d) $A = \begin{bmatrix} 3 & 0 & 0 \\ 8 & 4 & 0 \\ 6 & 2 & 5 \end{bmatrix}$
Q-8.	Verify Cayley –Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & -2 \\ 2 & 5 & -4 \\ 2 & 7 & -5 \end{bmatrix}$ and hence find A^{-1}.
Q-9.	Verify Cayley –Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ and use it to find A^4 and A^3.
Q-10.	Find a matrix that diagonalizes A, and determine $P^{-1}AP$ for (i) $A = \begin{bmatrix} 2 & 2 & -1 \\ 5 & -1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$ (ii) $A = \begin{bmatrix} 2 & 3 & -5 \\ 0 & 1 & -3 \\ -1 & -4 & 3 \end{bmatrix}$