Parul University

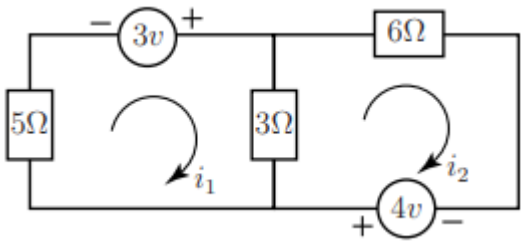
Faculty of Engineering & Technology

Department of Applied Sciences and Humanities

1st Year B. Tech Programme (All Branches)

Mathematics– 1 (303191101)

Unit – 3 MATRICES (Tutorial-1)

Q-1.	Identify if the following matrix are orthogonal or not. $(a)\begin{bmatrix}\cos\theta & -\sin\theta & 0\\ \sin\theta & \cos\theta & 0\\ 0 & 0 & 1\end{bmatrix}$
Q-2	Which of the following matrices are in row-echelon form, reduced-row echelon form or both? Justify your answer. $(a)\begin{bmatrix}1 & 3 & 4\\ 0 & 0 & 1\\ 0 & 0 & 0\end{bmatrix}$ $(b)\begin{bmatrix}1 & 0 & 0 & 5\\ 0 & 0 & 1 & 2\\ 0 & 1 & 0 & 7\end{bmatrix}$ $(c)\begin{bmatrix}1 & 0 & 0 & 2\\ 0 & 1 & 0 & 5\\ 0 & 0 & 1 & -1\end{bmatrix}$ $(d)\begin{bmatrix}0 & 1 & 3 & 5 & 0\\ 0 & 0 & 1 & -1 & 0\\ 0 & 0 & 0 & 0 & 1\end{bmatrix}$ $(e)\begin{bmatrix}1 & 0 & 0 & 0\\ 0 & 1 & 1 & 0\\ 0 & 0 & 0 & 1\\ 0 & 0 & 0 & 0\end{bmatrix}$
Q-3	In the circuit shown find the currents (i_1, i_2) in the loops 
Q-4	Solve the following systems of equations using Gauss elimination method. (a) $3x + 2y + z = 3$ $2x + y + z = 0$ $6x + 2y + 4z = 6$ (b) $2x_1 + x_2 + x_4 = 4$ $3x_1 - 2x_2 + 2x_3 = 2$ $5x_1 - 8x_2 - 4x_3 = 1$

Q-5	Solve the following systems of linear equations, by Gauss-Jordan Method. $x + 2y + z = 5$ $-x - y + z = 2$ $y + 3z = 1$
Q-6	Solve the following using any method and find the value of λ so that the equations have (i) a nontrivial solution (ii) a trivial solution. $2x + y + 2z = 0$ $x + y + 3z = 0$ $4x + 3y + \lambda z = 0$
Q-7	Find the value of x so that the rank of matrix A is (i) equal to 3 and (ii) less than 3. $A = \begin{bmatrix} 3-x & 2 & 2 \\ 1 & 4-x & 0 \\ -2 & -4 & 1-x \end{bmatrix}$
Q-8	Find eigen values and eigen vectors for the following matrices. Also determine algebraic multiplicity and geometric multiplicity of the matrices wherever possible. a) $\begin{bmatrix} 0 & 0 & -2 \\ 1 & 2 & 1 \\ 1 & 0 & 3 \end{bmatrix}$, b) $\begin{bmatrix} 4 & 0 & 1 \\ -2 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix}$ c) $\begin{bmatrix} -2 & 2 & 3 \\ 2 & 1 & 6 \\ 3 & 6 & 6 \end{bmatrix}$ d) $\begin{bmatrix} 2 & 3 \\ 4 & 2 \end{bmatrix}$
Q-9	Find a matrix that diagonalizes A, and determine $P^{-1}AP$ where $A = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$
Q-10	Find Characteristic polynomials and the inverse using Cayley-Hamilton theorem, $a)$ $\begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 3 \\ 4 & 0 \end{bmatrix}$ c) $\begin{bmatrix} 0 & 0 & -2 \\ 1 & 2 & 1 \\ 1 & 0 & 3 \end{bmatrix}$ d) $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$
Q-11	Show that matrix A is positive definite $A = \begin{bmatrix} 4 & 2 & 2 \\ 2 & 4 & 2 \\ 2 & 2 & 4 \end{bmatrix}$