LUKHDHIRJI ENGINEERING COLLEGE, MORBI

Subject: MATHEMTICS-1 Tutorial- 6 Sem-1 Branch: All

Matrix, System of linear equations and Eigen values

Ex-1 Which of the following 3×3 matrices are in reduced row-echelon form?

(a) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, (b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$, (d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$, (e) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, (f) $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$, (g) $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$,

Ex-2 Which of the following 3×3 matrices are in row-echelon form?

(a) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, (b) $\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$, (c) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 2 & 0 \end{bmatrix}$

Ex-3 Solve the following systems by Gauss-Jordan elimination method

(a) $\begin{aligned} x + y + z &= 9 \\ 2x - 3y + 4z &= 13 \\ 3x + 4y + 5z &= 40 \end{aligned}$ **(b)** $\begin{aligned} x + 3y + 6z &= 2 \\ 3x - y + 4z &= 9 \\ x - 4y + 2z &= 7 \end{aligned}$

Ex-4 Solve the following by Gauss elimination method

(a) $\begin{aligned} x - y + z &= 1 \\ -3x + 2y - 3z &= -6 \\ 2x - 5y + 4z &= 5 \end{aligned}$ **(b)** $\begin{aligned} 2x + 4y + z &= 3 \\ 3x + 2y - 2z &= -2 \\ x - y + z &= 6 \end{aligned}$

Ex-5 Solve $\begin{aligned} \frac{1}{x} + \frac{2}{y} + \frac{2}{z} &= 4 \\ \frac{3}{x} - \frac{1}{y} + \frac{4}{z} &= 25 \\ \frac{3}{x} + \frac{2}{y} - \frac{1}{z} &= -4 \end{aligned}$ by Gauss elimination method.

Ex-6 Using Gauss-Jordan method to find A^{-1}, if $A = \begin{bmatrix} 7 & 6 & 2 \\ -1 & 2 & 4 \\ 3 & 6 & 8 \end{bmatrix}$

Ex-7 Using Gauss-Jordan method to find A^{-1}, if $A = \begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & 2 \\ 1 & 2 & 2 \end{bmatrix}$

Ex-8 Obtained the reduced raw echelon form and hence determine the rank of the matrix A, if

$$A=\begin{bmatrix}3 & 4 & 5 & 6 & 7\\ 4 & 5 & 6 & 7 & 8\\ 5 & 6 & 7 & 8 & 9\\ 10 & 11 & 12 & 13 & 14\\ 15 & 16 & 17 & 18 & 19\end{bmatrix}$$

Ex-9 Find Eigen values, Eigen vectors of the matrix

$$A=\begin{bmatrix}3 & -2 & 2\\ -2 & 3 & 2\\ 2 & 2 & 3\end{bmatrix}$$

Ex-10 Find Eigen values, Eigen vectors of the matrix

$$A=\begin{bmatrix}1 & 0 & -1\\ 1 & 2 & 1\\ 2 & 2 & 3\end{bmatrix}$$

Ex-11 Find the Eigen values and Eigen vectors of $A=\begin{bmatrix}2 & 1 & 1\\ 1 & 2 & 1\\ 0 & 0 & 1\end{bmatrix}$

Ex-12 Verify Caley-Hamilton theorem for following matrix.

$$A=\begin{bmatrix}1 & 0 & -3\\ -1 & 1 & 2\\ 4 & -1 & 0\end{bmatrix}$$

Ex-13 Find $A^5-3A^4+2A^3+4A^2$ if $A=\begin{bmatrix}1 & -1\\ -1 & 2\end{bmatrix}$

Ex-14 Find A^{-1} for the following matrices by Caley-Hamilton theorem.

(a) $A=\begin{bmatrix}-1 & 3 & 0\\ 1 & -2 & 1\\ 4 & 1 & 0\end{bmatrix}$, (b) $A=\begin{bmatrix}3 & 4 & -1\\ 0 & 2 & 3\\ 1 & 1 & 0\end{bmatrix}$

Ex-15 If $A=\begin{bmatrix}1 & 2 & 0\\ 0 & -1 & 0\\ 3 & -7 & 4\end{bmatrix}$ then show that $A^4+A^3+A^2+A+I=22A^2+2A-19I$.

Ex-16 Find an orthogonal matrix P that diagonalize $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}$

Ex-17 Diagonalize $A = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 3 & 0 \\ -2 & 0 & 1 \end{bmatrix}$