Shantilal Shah Engineering College ,Bhavnagar

B.E. Sem-I (All Branches)   **Sub :Mathematics-1(3110014)**

Tutorial :2   **Topic :Matrices**

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Ex-1 In each part determine whether the following matrix is in row echelon form, reduced row echelon form, both or neither :

$$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & -6 & 4 & 3 \\ 0 & 1 & 3 & 2 \end{bmatrix}, \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & -1 \end{bmatrix}, \begin{bmatrix} 1 & 0 & 0 & 5 \\ 0 & 0 & 1 & 2 \\ 0 & 1 & 0 & 7 \end{bmatrix}, \begin{bmatrix} 0 & 1 & -4 & 0 & 1 \\ 0 & 0 & 0 & 1 & 4 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}.$$

Ex-2 Find the a row echelon form (Gauss-elimination method) of the following

Matrices & find it's rank also:

$$\begin{bmatrix} 0 & -1 & 2 & 3 \\ 2 & 3 & 4 & 5 \\ 1 & 3 & -1 & 2 \\ 3 & 2 & 4 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 2 & -3 & 1 \\ -1 & 0 & 3 & 4 \\ 0 & 1 & 2 & -1 \\ 2 & 3 & 0 & -3 \end{bmatrix}, \begin{bmatrix} 3 & 1 & -1 & 2 \\ 1 & -1 & 1 & 2 \\ 2 & 2 & 1 & 6 \end{bmatrix}, \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Ex-3 Find the a reduced row echelon form (Gauss Jordan -elimination method)

of the following Matrices& find it's rank also:

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}, \begin{bmatrix} 1 & 2 & -3 & 1 \\ -1 & 0 & 3 & 4 \\ 0 & 1 & 2 & -1 \\ 2 & 3 & 0 & -3 \end{bmatrix}, \begin{bmatrix} 3 & 1 & -1 & 2 \\ 1 & -1 & 1 & 2 \\ 2 & 2 & 1 & 6 \end{bmatrix}, \begin{bmatrix} 1 & -1 & 1 & 0 & 2 \\ 2 & -2 & 0 & 2 & 2 \\ -1 & 1 & 2 & -3 & 1 \\ -2 & 2 & 1 & -3 & -1 \end{bmatrix}$$

Ex-4 Solve each of the following system by Gauss elimination method:

(i) $x+y+z=9, x+y-z=1, 2x+2y-2z=0.$

(ii) $3x+y-3z=13, 2x-3y+7z=5, 2x+19y-47z=32.$

(iii) $-x+3y+4z=30, 3x+2y-z=9, 2x-y+2z=10.$`

Ex-5 Investigate for what value of λ and η the equations

$x+2y+z=8, 2x+2y+2z=13, 3x+4y+\lambda z=\eta.$

have (i) no solution (ii) unique Solution (iii) many solution.

Ex-6   Find the number of parameters in general solution of Ax=0 if A is 5x7

Matrix of rank 3.

EX-7 If A is an mxn matrix ,what is the largest possible value for it's rank ?.

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Ex-8 Examine the consistency of the following system of equations &

solve them, If they are consistent.

(i) $x+4y+4z=2, 2x+4y+z=1, x+5y+2z=-1, x+2y+8z=8.$

(ii) $x-2y+z-3w=-3, -3x+y-z+2w=2, 4x+3y-3z+w=1.$

(iii) $5x+3y+4z=0, 2x-y+z=0, 3x+y+2z=0.$

Ex-9 Solve the following system equation by Gauss Jordan-elimination method:

(i) $x+2y+z=3, 2x+y+3z=5, 2x+4y2z=7.$

(ii) $2x+y-z=2, x-3y+z=1.$

Ex-10 Find the inverse of following matrices by Gauss Jordan method:

$(i)\begin{bmatrix} 1 & 0 & 1 \\ -1 & 1 & -1 \\ 0 & 1 & 0 \end{bmatrix}, (ii)\begin{bmatrix} \frac{1}{5} & \frac{1}{5} & \frac{-2}{5} \\ \frac{1}{5} & \frac{1}{5} & \frac{1}{10} \\ \frac{1}{5} & \frac{-4}{5} & \frac{1}{10} \end{bmatrix}. (iii)\begin{bmatrix} 3 & -1 & 5 \\ 2 & 6 & 4 \\ 5 & 5 & 9 \end{bmatrix}(iv)\begin{bmatrix} -1 & 2 & 3 \\ -4 & 5 & -6 \\ 7 & -8 & 9 \end{bmatrix}$

Ex-11 Find the rank of the matrix A in terms of determinant, where $A=\begin{bmatrix} 2 & -1 & 3 \\ 4 & -2 & 6 \\ -6 & 3 & -8 \end{bmatrix}$

Ex-12 Define the following:

Rank of matrix, Singular matrix ,Invertible matrix, Symmetric matrix.

Ex-13 Find the Eigen value and Eigen Vector for the following matrices:

$(1)\begin{bmatrix} 5 & 3 \\ 1 & 3 \end{bmatrix}$ $(2)\begin{bmatrix} 3 & 2 & 3 \\ 0 & 6 & 10 \\ 0 & 0 & 2 \end{bmatrix}$ $(3)\begin{bmatrix} 1 & -6 & -4 \\ 0 & 4 & 2 \\ 0 & -6 & -3 \end{bmatrix}$ $(4)\begin{bmatrix} -420 & \frac{1}{2} & 576 \\ 0 & 0 & 0.6 \\ 0 & 0 & \sqrt{3} \end{bmatrix}$

Ex-14 Show that if $0 < \theta < \pi$, then A=$\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ has no real

Eigen Value and Consequently no Eigen Vectors.

Ex-15 For the matrix A=$\begin{bmatrix} 2 & 0 \\ 3 & 3 \end{bmatrix}$,Find the Eigen Values of

(i) A (ii) A' (iii) A^2 (iv) A^{-1} (v) adjA (vi) 3A (vii) A^3+A^2+A+2I