Date:

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Subject:- Linear Algebra
Instructor:-

MID TERM

Question:- 1

$$\begin{bmatrix} 1 & ID3 & 3 & 0 & 5 \\ 0 & 1 & -ID\text{-}Last & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & ID3 \end{bmatrix}$$

Solution:- This augmented matrix can be written as;

$$\left[\begin{array}{cccc|c} 1 & 0 & 3 & 0 & 5 \\ 0 & 1 & -1 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 0 \end{array}\right]$$

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Now to Solve its, we Should Convert it into reduse echelon form.

$$\begin{array}{l} \\ R_1 - 3R_3 \sim \\ R_2 + R_3 \sim \\ \\ \end{array} \left[\begin{array}{cccc|c} 1 & 0 & 3 & 0 & 5 \\ 0 & 1 & -1 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 0 \end{array}\right]$$

$$\left[\begin{array}{cccc|c} 1-0 & 0-0 & 3-3 & 0-0 & 5+18 \\ 0 & 1+0 & -1+1 & 0+0 & 7-6 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 0 \end{array}\right]$$

$$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 23 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 0 \end{array}\right] \text{ Answer!}$$

we can See that it is Converted into reduced echelon matrix. Hence, we can Say that for Solving the given matrix, we have to perform 2 elementry row operation and these operation are, $R_1 - 3R_3$ and $R_2 + R_3$

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Find the elementary row operation that transform the first matrix into
(a) Second and reverse row operation that transform the Second matrix into first.

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

Solution:-

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 2 & -5 & -1 \end{bmatrix}$$

$$\underset{R_3-2R_2}{\sim} \begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0-0 & 2-2 & -5+8 & -1-4 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 0 & 3 & -5 \end{bmatrix}$$

So, the first matrix can be

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Converted into the Second with elementary row operation,

$\boxed{R_3 - 2R_2}$

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

Solution:-

$$R_3 + 2R_2 \begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 0 & 3 & -5 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0+0 & 0+2 & 3-8 & -5+4 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 2 & -5 & -1 \end{bmatrix}$$

So, the reverse row operation that transforms the Second matrix into first is

$\boxed{R_3 + 2R_2}$

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Question 2 Part b

a.
$$\begin{bmatrix} e & 0 & 0 & 0 \\ 0 & \pi & 0 & 0 \\ 0 & 0 & -\pi & 0 \\ 0 & 0 & 0 & e \end{bmatrix}$$

Statements:- A matrix Said to be R.echelon form Multiply one row by a constant and then the result to the other row.

b.
$$\begin{bmatrix} 1 & 0 & \pi \\ 0 & 1 & e \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

Statment A matrix Said to be in echelon form becace there have leading element.

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c. $\begin{bmatrix} 5 & 0 & 0 & 7 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 4 \end{bmatrix}$

Statement:-
This is is echelon form.

d. $\begin{bmatrix} 1 & 0 & 0 & 7 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 4 \end{bmatrix}$

Statement:-
A matrin is said to be in echelon form becaus here have leading element 1.

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Question 3

The row echelon form is used to solve the System of linear equation.

a) what is the difference between the row enchelon and reduced row echelon form? what is the Practical use of reduce row enchelon form?

The echelon form of a matrix isn't unique, which means there are infinite answers possible when you perform row reduction.

Row echelon reduced form is at the other end of the Spectrum; it is unique which mean row-reduction

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on a matrix will produced the Same answer no matter how you perform the row operation.

Forexample

~~ene~~ echelon form

1. The first non-zero element in each row (column), Called the leading entry is(1)

2. Each leading entry is in a column(row) to the right of the leading entry in the previous row (column).

3. Rows (column) with all zero element, if any are below (after) the row (column) having a non-zero element

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix} \rightarrow \text{echelon form}$$

Reduce echelon form:-

A matrix is said to be in reduce row (column) echelon form when it is satisfies the following condition,

1. The matrix satisfies condition for a row (column) echelon form

2. The leading entry in each row (column) is the only non-zero entry in its column row.

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$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \rightarrow \text{Reduce echelon form.}$$

Question 3

Part b

$$\begin{bmatrix} 1 & 1D2 & 8 \\ 2 & 8 & -1 \\ -1D3 & 0 & 0 \\ 1 & -4 & 1D-\text{first}-\text{last} \end{bmatrix}$$

I put my Id at the matrix

now this matrix 16041 Solution is that;

$$\begin{bmatrix} 1 & 6 & 8 \\ 2 & 8 & -1 \\ -0 & 0 & 0 \\ 1 & -4 & 11 \end{bmatrix}$$

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$$\begin{bmatrix} 1 & 6 & 8 \\ 2-2 & 8-12 & -1-16 \\ 0 & 0 & 0 \\ 1 & -4 & 11 \end{bmatrix} \quad 2R_1 - R_2$$

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & -4 & -17 \\ 0 & 0 & 0 \\ 1 & -4 & 11 \end{bmatrix} \quad R_3 \leftrightarrow R_2$$

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & -4 & -17 \\ 1 & -4 & 11 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & -4 & -17 \\ 1-1 & -4-6 & 11-8 \\ 0 & 0 & 0 \end{bmatrix} \quad R_3 - R_1$$

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & -4 & -17 \\ 0 & -10 & 3 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & -4 & -17 \\ 0-0 & -10(-4) & 3-(-17) \\ 0 & 0 & 0 \end{bmatrix} R_3 - R_2$$

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & -4 & -7 \\ 0 & -6 & 20 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & -4 & -7 \\ 0 & -6 & 20 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & -4 & -7 \\ 0+1 & -6+6 & 20+8 \\ 0 & 0 & 0 \end{bmatrix} R_3 + R_1$$

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & -4 & -7 \\ 1 & 0 & 18 \\ 0 & 0 & 0 \end{bmatrix}$$

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$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & -4 & -7 \\ 0\times 1 & 0\times -4 & 28\times -7 \\ 0 & 0 & 0 \end{bmatrix} R_3 \times R_2$$

$$\begin{bmatrix} 1 & 6 & 8 \\ 0 & -4 & -7 \\ 0 & 0 & 196 \\ 0 & 0 & 0 \end{bmatrix}$$ Answer!