NAME :- M. Junaid
ID :- 16027
Subject :- linear AlGEBRa
Siction :- "A"

Program :- Bs(SE)

Smeter :- 2nd

Q 1

Consider the given below Matrix as the augmented Matrix of linear System Explain in your words the next elementry Row Operation that Should be performed in order to Solve the System Where ID3 is the 3rd Digit in your ID in inverse e.g if your ID is 12345 then -ID last = 5 ?

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

ANSWER :- ID = 16027

given that ID3 = 3rd Digit of ID = 0

ID = last Digit inverse = 7

Putting Value :-

$$\begin{bmatrix} 1 & 0 & 0 & 5 \\ 0 & 1 & 0 & 7 \\ 0 & 0 & 0 & -6 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

p.t.o

Now Row Operation :-

$$R_2 + 7R_3 \begin{bmatrix} 1 & 0 & 3 & 0 & 5 \\ 0 & 1 & 0 & 0 & -35 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

R_2 , 0 1 -7 0 7

$7R3$: 0 0 7 0 -42

0 1 0 0 -35

$$R_1 - 3R \begin{bmatrix} 1 & 0 & 0 & 0 & 23 \\ 0 & 1 & 0 & 0 & -35 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

R_1 : 1 0 3 0 5

$-3R_3$: 0 0 -3 0 18

1 0 0 0 23

P.T.O

Now auggmented Matrix convert to system of linear form

i.e

$$1x_1 + 0x_2 + 0x_3 + 0x_4 = 23$$

$$\Rightarrow \quad x_1 = 23$$
$$x_2 = -35$$
$$x_3 = -6$$
$$x_4 = 0$$

—xxx —xxx —xxx —xx

Q2 :-

(A)

Find the elementry Row Operation that transforms the first Matrix into Second and reverse row Operation that transforms the Second Matrix into first ?

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

Salution :-

In order to transform the first Matrix into the Second, we will Multiply -2 with row 2 ~~[illegible]~~ and then add the row 2 to row 3

$-2R_2 + R_3$:-

$-2x$ row 2 : $\quad 0 \; 1 \; -4 \; 2$

$\qquad\qquad\quad 0 \; -2 \; 8 \; -4$

Now adding it to row 3

P.t.O

$$\begin{array}{cccc} 0 & \cancel{-2} & 8 & -4 \\ +0 & \cancel{2} & -5 & -1 \\ \hline 0 & 0 & 3 & -5 \end{array}$$

Puting the newly formed row 3 into the first Matrix :

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

Hence we transformed the first Matrix into the Second Matrix

Now applying reverse row operation and turning the Second Matrix into the first.

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

Multiplying 2 with row 2 and adding it to row 3

P.t.o

P.t.o

$2R_2 + R_3$

$$\begin{array}{cccc} 0 & 2 & -8 & 4 \\ 0 & 0 & 3 & -5 \\ \hline 0 & 2 & -5 & -1 \end{array}$$

Putting back the new row 3 obtained above, into the Second Matrix and transforming it to Matrix no first.

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

—xxx —xx —xx —xx —

P.T.O

(B)

Given below are Some Matrices. Find where these are in the forms written in front of them or not. Explain in your own words for each of the Solution in detail.

Solution:

(A)

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

This Matrix is not echelon form becous the Most below rows have "e" element is not Zero and for echelon form there Must be all Zero element in the last line.

P.T.O

(B)

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

in this one is echelon form becous the pivot element having Zero in their below row ~~are~~ and last row have also Zero element

(C)

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

this is not reduced echelon form becous having non Zero row at the bottom.

Previous Row

P.T.O

"D"

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

this is reduced echelon form if when we transpose $R_2 \longleftrightarrow R_3$ then the bottom line will be have zero element.

Q3 :.

part "A"

The Row echelon form is used to Solve the System of linear equations. What is the difference between the row echelon and reduced Row echelon form.? what is the practical use of reduced Row echelon form Give one example.?

Row echelon form :.

A Matrix is Said to be in row echelon ~~form~~ for When it Satisfies the following Conditions :-

(1) The first non-zero element in each Row called leading entry is 1

(2) Each leading entry is in a row to the right of the leading entry in the Previous Row

P.t.o

(3) Row with all zero elements, if any are below (after) the row having non-zero element

Example :-

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

Reduced Row Echelon form :-

★ A matrix is said to be in reduced row echelon form when it satisfies the following condition :-

(1) The matrix stisfies condition for a Row chelom form.

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

p.t.o

Example :-

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

therefore we can say that each reduced row echelon form is also a Row echelon form but vice versa is not always true.

xxx — xxx — xxx — xxx — xxx — xxx

Q 3 :. Part (B)

Find in echelon form for the below Matrix using row operation when ID2 is 2nd digit in your ID eg if your ID is 12345 ID2 = ID3 = ID-first-last and last digit of your ID.e.15

$$\begin{bmatrix} 1 & ID2 & 8 \\ 2 & 8 & -1 \\ -ID3 & 0 & 0 \\ 1 & -4 & ID\text{-first}-\text{last} \end{bmatrix}$$

Solution :.

Requierment

ID = 16027

(1) $ID_2 = 6$

(2) $ID3 = 0$

(3) First last = 17

P.t.o

$$1D3R4+R3 \quad \begin{vmatrix} 1 & 1D2 & 8 \\ 2 & 8 & -1 \\ 0 & 0 & 1 \\ 1 & -4 & 1DFL \end{vmatrix}$$

$$\tfrac{1}{8} \quad R_2+R_1 \quad \begin{vmatrix} 1 & 1D2 & 8 \\ 2/8 & 1 & -1/8 \\ 0 & 0 & 1 \\ 1 & -4 & 1DFL \end{vmatrix}$$

$$17R_3 \quad \begin{vmatrix} 1 & 6 & 10 \\ 2/8 & 6 & -1/8 \\ 0 & 0 & 17 \end{vmatrix}$$

$$\begin{array}{l} \\ \underline{1DFL} \\ 1DF_2 \\ 16R_3+R_4 \end{array} \begin{vmatrix} 1 & 6 & 8 \\ 2/8 & 1 & -1/8 \\ 0 & 0 & 16 \\ 1 & -4 & 1 \end{vmatrix}$$

$$R_4+R_3 \quad \begin{vmatrix} 1 & 6 & 8 \\ 2/8 & 1 & -1/8 \\ 0 & 0 & 16 \\ 1 & -4 & 17 \end{vmatrix}$$

P.T.O

$$2/8\, R_2 \quad \begin{vmatrix} 1 & 6 & 8 \\ 1 & 6 & -1/4 \\ 0 & 0 & 16 \\ 1 & -4 & 17 \end{vmatrix}$$

$$R_3 - R_2 \quad \begin{vmatrix} 1 & 6 & 10 \\ 1 & 0 & 4 \\ 0 & 0 & 16 \\ 1 & -4 & 17 \end{vmatrix}$$

Ans

xxx — xxx — xxx — xxx — xxx