INU

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Subject : Linear ALGEBRA

Question 1:

Ans:

$$\begin{bmatrix} 1 & ID_3 & 3 & 0 & 5 \\ 0 & 1 & -ID\text{-}last & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & ID_3 \end{bmatrix}$$

Let my ID is 12345

Then matrix will be such that

$$\text{i.e} \begin{bmatrix} 1 & 3 & 3 & 0 & 5 \\ 0 & 1 & -5 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 3 \end{bmatrix}$$

$$\underset{\sim}{R} \begin{bmatrix} 1 & 0 & 18 & 0 & -16 \\ 0 & 1 & -5 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 3 \end{bmatrix} R_1 - 3R_2$$

$$\underset{\sim}{R} \begin{bmatrix} 1 & 0 & 18 & 0 & -16 \\ 0 & 1 & -5 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 3 \end{bmatrix} R_2 \leftarrow R_2 + 5R_3$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 92 \\ 0 & 1 & 0 & 0 & -23 \\ & & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 3 \end{bmatrix} R_2 - 18R_3$$

That is the reduced row echelon form.

Q: 2: Two, 2. a)

a)

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

Sol:

We transform 1st matrix into second matrix by row operation:

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

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

Now transform second matrix into first by reverse row operation.

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

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

Hence it is transform into 1st.

Q.2. b)

(b)

a) $\begin{bmatrix} e & 0 & 0 & 0 \\ 0 & \pi & 0 & 0 \\ 0 & 0 & -\pi & 0 \\ 0 & 0 & 0 & e \end{bmatrix}$ is in echelon form.

Ans: Yes the given matrix is in echelon form. Because each of successive non-zero row. The number of zero before the first non zero entry increase row by row. and all elements ~~below above~~ below the main daingal is zero.

b) $\begin{bmatrix} 1 & 0 & \pi \\ 0 & 1 & e \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ is in echelon form.

Ans: Yes, It is in echelon form. Because It is ~~sta~~ satisfie Both condition of echelon form.

c) $\begin{bmatrix} 5 & 0 & 0 & 7 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 4 \end{bmatrix}$ is in reduced row echelon form.

Ans: The given matrix is not in reduced row echelon form. Because the pivot element of the first row. Because it is not 1.

d) $\begin{bmatrix} 1 & 0 & 0 & 7 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 4 \end{bmatrix}$ is in reduced row echelon form.

Ans: In the above matrix is not reduced row echelon form Because its first row is not ~~ze~~ one.

Q3 a)

Ans: **Echelon Form:** A ractangular matrix is in echelon form (or row echelon form) if the ~~#~~ following three properties it have:

*) All nonzero rows are above any rows of all zero.

*) Each leading of a row is in a column to the right of the leading entry of the row above it.

*) All elements and entries in a column below a leding entry are zero.

For Example:

1. $\begin{bmatrix} 1 & 6 & 0 & 9 \\ 0 & -1 & -2 & -7 \\ 0 & 0 & 3 & 9 \end{bmatrix}$

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

Each matrix is row equivelent to One and only one reduced echelon matrix i.e. reduce echelon matrix of a matrix is Unique.

Q.3 a)

Reduced Echelon form:

If a matrix in echelon form satisfie the following ~~thr~~ additional condition, it is in reduced Echelon form (or reduced row Echelon form). The Matrix

*) The Entry and leading element in each nonzero row is 1.

*) Each leading 1 is the only nonzero entry in its column.

For Example.

$$\begin{bmatrix} 1 & 0 & 0 & -3 \\ 0 & 1 & 0 & 16 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

Any nonzero matrix may be reduced to more then one echelon form i.e. echelon form of a matrix is not unique.

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Q.3

b) sol

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

if ID is 12345

Then ID2 = 2   ID3 = 3

and ID first, last = 15

Put in a given matrix.

$$= \begin{bmatrix} 1 & 2 & 8 \\ 2 & 8 & -1 \\ 3 & 0 & 0 \\ 1 & 4 & 15 \end{bmatrix} \Rightarrow \underset{\sim}{R} \begin{bmatrix} 1 & 2 & 8 \\ 0 & 4 & -17 \\ 0 & 6 & 24 \\ 1 & -4 & 15 \end{bmatrix}$$

by $R_2 - 2R_1$

by $R_3 + 3R_1$

$$= \underset{\sim}{R} \begin{bmatrix} 1 & 2 & 8 \\ 0 & 4 & -17 \\ 0 & 6 & 24 \\ 0 & -6 & 7 \end{bmatrix} \text{ by } R_4 - R_1$$

$$= \underset{\sim}{R} \begin{bmatrix} 1 & 2 & 8 \\ 0 & 4 & -17 \\ 0 & 0 & 31 \\ 0 & -6 & 7 \end{bmatrix} \text{ by } R_3 + R_4$$

This Question solve by row operation