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ID No 16373

Class BS Software Engineering Section (B)

Subject: **Linear Algebra**

Mid Term Assignment

Second Semester

Teacher Name

Sir Shakeel

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Q1) ID- 16373

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

$$\begin{bmatrix} 1 & 3 & 3 & 0 & 5 \\ 0 & 1 & -\underline{3} & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 3 \end{bmatrix}$$

$$\left[\begin{array}{cccc|c} 1 & 3 & 0 & 0 & 23 \\ 0 & 1 & 0 & 0 & -11 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right] \quad \begin{array}{l} R_1 - 3R_3 \\ R_2 + 3R_3 \end{array}$$

$$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 10 \\ 0 & 1 & 0 & 0 & -11 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right] \quad R_1 - 3R_2$$

$x_1 = 10$

$x_2 = -11$

$x_3 = -6$

$x_4 = 3$

Q2 Part (A) :- Find the elementary row operation that transforms the first matrix in to second and reverse row operation that transforms the second matrix into first?

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

Ans: ①

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

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

L.H.S

②

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

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

R.H.S

Q No 2 :- Part(b)

Given below are some matrices. Find wheather these are in the forms written infront of them or not. Explain in your own words for each of the selection in detail.

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, its is echelon form because its Triangular matriks.

(b) $\begin{bmatrix} 1 & 0 & \pi \\ 0 & 1 & e \\ 0 & 0 & 8 \\ 0 & 0 & 0 \end{bmatrix}$ is in echelon form.

Ans:- Yes, it is also echelon form because upper triangular matrix.

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

Ans:- Its not in reduce row echelon form because the diagonals are not identity. so that's why it is not reduce row echelon form.

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

Ans:- As the same answer It is also not reduce row echelon form because that diagonals are not identity so that's why its is not reduce row echelon form.

QNo 3 Part (a) The row echelon form is used to solve the system of linear equations. what is differente between the row echelon and reduced row echelon form? what is the partical use of reduced row echelon form? Give one exemple.

Ans: Row echelon form:- In row echelon form the matrix is not unique. which means there are infinite answer possible. when we perform row operation.

Example:-

$$\begin{bmatrix} 1 & 5 & -5 & 15 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

Reduce Row echelon form:- Its other end of spectrum its is unique which means it will produce same answer. no matter how you perform the same row operations.

Example:-

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

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Q No 3

part (B)

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

So

$$\begin{bmatrix} 1 & 6 & 8 \\ 2 & 8 & -1 \\ -3 & 0 & 0 \\ 1 & -4 & 13 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 8 & -1 \\ 1 & 6 & 8 \\ 1 & 0 & 0 \\ 1 & -4 & 13 \end{bmatrix} \quad \begin{matrix} -1/3\, R_3 \\ R_2 \longleftrightarrow R_1 \end{matrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & 6 & 8 \\ 2 & 8 & -1 \\ 1 & -4 & 13 \end{bmatrix} \quad R_1 \longleftrightarrow R_3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 6 & 8 \\ 0 & 8 & -1 \\ 0 & -4 & 13 \end{bmatrix} \quad \begin{matrix} R_2 - R_1 \\ R_3 - 2R_1 \\ R_4 - R_1 \end{matrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 0 & 25 \\ 0 & -4 & 13 \end{bmatrix} \quad \begin{matrix} \frac{1}{2} R_2 \\ R_3 + 2R_4 \end{matrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 0 & 1 \\ 0 & -4 & 13 \end{bmatrix} \quad \frac{1}{25} R_3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 0 & 1 \\ 0 & -4 & 0 \end{bmatrix} \quad R_4 - 13R_3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \quad -\frac{1}{4} R_4$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 4 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \quad R_2 - 3R_4$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 4 \end{bmatrix} \quad R_2 \longleftrightarrow R_4$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix} \quad R_4 - 4R_3$$

S.J