ID:- 15791

"MATHS PAPER"

QUESTION No:1

Consider the given below ....
.... then -ID-last =-5.

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

SOLUTION:-

My ID is 14672

Given Matrix be A:

$$1x + 6y + 3z + 0t = 5$$
$$0x + 1y - 2z + 0t = 7$$
$$0x + 0y + 1z + 0t = -6$$
$$0x + 0y + 0z + 1t = 6$$

$$\begin{bmatrix} 1 & 6 & 3 & 0 \\ 0 & 1 & -2 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ t \end{bmatrix} = \begin{bmatrix} 5 \\ 7 \\ -6 \\ 6 \end{bmatrix}$$

Let the augmented matrix be:

$$A = \left[\begin{array}{cccc|c} 1 & 6 & 3 & 0 & 5 \\ 0 & 1 & -2 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 6 \end{array}\right]$$

$R_1 \sim R_1 - 6R_2$

$$= \left[\begin{array}{cccc|c} 1 & 0 & 15 & 0 & -37 \\ 0 & 1 & -2 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 6 \end{array}\right]$$

$R_2 \sim R_2 + 2R_3$

$$= \left[\begin{array}{cccc|c} 1 & 0 & 15 & 0 & -37 \\ 0 & 1 & 0 & 0 & 5 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 6 \end{array}\right]$$

$R_1 \sim R_1 - 15R_3.$

$$= \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 53 \\ 0 & 1 & 0 & 0 & 5 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 6 \end{array}\right]$$

Hences

So, we get the values of x, y, z and t

$x = 53$

$y = 5$

$z = -6$

$t = 6$

QUESTION: 2

Part "A"

Find the elementary row .... 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:-

Let first matrix be A.
Let Second matrix be B.

Elementary Row Operation:-

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

$R_3 \to R_3 - 2R_2$.

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

Reverse Row Operation.

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

$R_3 \to 2R_2 + R_3$

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

Hence Showed.

PART: "B"

Given below are some matrices. - - - -

. . . . 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.

SOLUTION:-

Let

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

Yes, matrix A is in echelon form because of its definition, as echelon form of a matrix states that "If a column contains a leading entry then all entries below

that leading entry are zero."
In matrix A, it satisfies the definition of echelon form of a matrix, So it is in echelon form.

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

SOLUTION:-

Let $B = \begin{bmatrix} 1 & 0 & \lambda \\ 0 & 1 & e \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

Yes, matrix B is in echelon form because of its definition which states that "If a column contains a leading entry then all entries below that leading entry are zero".
According to definition, matrix B is columns containing ~~en~~ leading entries as 1 and below that all entries are zero. So matrix B is in echelon form.

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

Solution:-

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

$C = \begin{bmatrix} 5/5 & 0/5 & 0/5 & 7/5 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 4 \end{bmatrix} \quad R_1/5$

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

Yes, matrix C is in reduced row echelon form, because reduced row echelon form states that "In reduced row echelon form the leading co-efficient must be 1, in each row is to the right of the leading co-efficient in the row above it.

According to definition matrix C satisfies the definition properties. So it is in reduced row echelon form.

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

SOLUTION:-

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

No, matrix D is not in reduced row echelon form, because if it is in reduced row echelon form then its rows (non-zero) contains its first entries as a number "1" which is known as leading 1 i.e; the first non-zero entry is 1. Also if there are any rows containing only one entries then they are located in bottom part of the matrix but in matrix D the zero row is located in mid of matrix, So it is not in reduced row echelon form.

QUESTION: 3
PART: "A"
The row echelon form is used .... Give one example.

ANSWER:-

ROW ECHELON FORM	REDUCED ECHELON FORM
1) It is defined as; "the leading entry in row echelon form in each row (column) is the only non-zero entry in its row (Column).	It is defined as; "In reduced row echelon form the leftmost non-zero entry of a row is equal to 1. The leftmost non-zero entry of a row is the only non-zero entry in the column.
2) Echelon form of a matrix isn't unique which mean there are infinite answers Possible when we Perform row reduction or elementary operation.	It is a unique form, which mean when we apply elementary row operation on a matrix it will Produce the same answer, no matter how we perform the same row operation.

3)	Each row containing a non-zero number has the number 1 appearing in the row's first non-zero column. Such entry will be known as "leading entry".	The left most non-zero entry of a row is equal to 1. The left most non-zero entry of a row is the only non-zero entry in its column.
4)	The entries only below the first leading non-zero entry that must be zero not necessary for above one's.	The entries below or above the first 1 in each row must all be 0.
5)	Example:- $\begin{bmatrix} 1 & 6 & 2 & -8 \\ 0 & 1 & 14 & 5 \\ 0 & 0 & 1 & 1 \end{bmatrix}$	Example:- $\begin{bmatrix} 1 & 0 & -2 & 0 & 6 \\ 0 & 1 & 7 & 0 & 1 \\ 0 & 0 & 0 & 1 & 5 \end{bmatrix}$

PRACTICAL USE OF REDUCED ROW ECHELON FORM:-

1) This type of matrix is used to solve system of linear equation.

2) It is used in balancing chemical equations.

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3) Such matrix is used to solve Computer Operations.

→ EXAMPLE OF REDUCED ROW ECHELON FORM:-

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

PART: "B"

Find an echelon .... row operation.

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

first last

Solution:-

ID = 16746.

$$\begin{bmatrix} 1 & 6 & 8 \\ 2 & 8 & -1 \\ -7 & 0 & 0 \\ 1 & -4 & 16 \end{bmatrix}$$

$-2R_1 + R_2 = R_2.$

$$= \begin{bmatrix} 1 & 6 & 8 \\ 0 & -2 & -17 \\ -7 & 0 & 0 \\ 1 & -4 & 16 \end{bmatrix}$$

$7R_1 + R_3 = R_3$

$$= \begin{bmatrix} 1 & 6 & 8 \\ 0 & -2 & -17 \\ 0 & 35 & 56 \\ 1 & -4 & 16 \end{bmatrix}$$

$-R_1 + R_4$

$$= \begin{bmatrix} 1 & 6 & 8 \\ 0 & -2 & -17 \\ 0 & 35 & 56 \\ 0 & -9 & 8 \end{bmatrix}$$

$-1/2\, R_2$

$$= \begin{bmatrix} 1 & 6 & 8 \\ 0 & 1 & 17/2 \\ 0 & 35 & 56 \\ 0 & -9 & 8 \end{bmatrix}$$

$-35 R_2 + R_3$

$$= \begin{bmatrix} 1 & 6 & 8 \\ 0 & 1 & 17/2 \\ 0 & 0 & -483/2 \\ 0 & -9 & 8 \end{bmatrix}$$

$$\frac{-2}{483} R_3$$

$$= \begin{bmatrix} 1 & 6 & 8 \\ 0 & 1 & 17/2 \\ 0 & 0 & 1 \\ 0 & -9 & 8 \end{bmatrix}$$

$$9R_2 + R_4$$

$$= \begin{bmatrix} 1 & 6 & 8 \\ 0 & 1 & 17/2 \\ 0 & 0 & 1 \\ 0 & 0 & 157/2 \end{bmatrix}$$

$$\frac{-157}{2} R_3 + R_4$$

$$= \begin{bmatrix} 1 & 6 & 8 \\ 0 & 1 & 17/2 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

Hence this is the required echelon form.