ID # 12724

Final Term

Data = 30/6/2020

Q3 :- Given data :-

$$2x + 2y + 4z = 18$$
$$x + 3y + 2z = 13$$
$$3x + y - 3z = 14$$

Sol :-

$$\begin{bmatrix} 2 & 2 & 4 & 18 \\ 1 & 3 & 2 & 13 \\ 3 & 1 & -3 & 14 \end{bmatrix} \quad R_1 = \frac{1}{2} R_1$$

$$= \begin{bmatrix} 1 & 1 & 2 & 9 \\ 1 & 3 & 2 & 13 \\ 3 & 1 & -3 & 14 \end{bmatrix} \quad R_2 = R_2 - R_1 \quad R_3 - 3R_1$$

$$= \begin{bmatrix} 1 & 1 & 2 & 9 \\ 0 & 1 & 0 & 4 \\ 0 & -2 & -9 & -13 \end{bmatrix} \quad R_2 = \frac{1}{2} R_2$$

$$= \begin{bmatrix} 1 & 1 & 2 & 9 \\ 0 & 1 & 0 & 2 \\ 0 & -2 & -9 & -13 \end{bmatrix} \quad R_3 + 2R_2$$

$$= \begin{bmatrix} 1 & 1 & 2 & 9 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & -9 & -9 \end{bmatrix} \quad R_1 = R_1 - 1R_2 \quad R_3 = \frac{-1}{9} R_3$$

$$\begin{bmatrix} 1 & 0 & 2 & 7 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 1 \end{bmatrix} \quad R_1 - 4R_3$$

$$\begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 1 \end{bmatrix} \Rightarrow \boxed{\begin{aligned} x &= 3 \\ y &= 2 \\ z &= 1 \end{aligned}}$$

Ans

ID = 12724 Page (2) Farhan shah

30/6/2020

Q 08 => Reduce the matrix

$$\begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 0 \end{bmatrix}$$

Sol:-

$$\begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 0 \end{bmatrix} \begin{matrix} R_2 - 3R_1 \\ R_3 - R_1 \end{matrix}$$

$$\begin{bmatrix} 1 & 3 & 4 & 3 \\ 0 & 0 & 0 & -6 \\ 0 & 0 & 0 & -3 \end{bmatrix} -2R_3 - R_2$$

$$\begin{bmatrix} 1 & 3 & 4 & 3 \\ 0 & 0 & 0 & -6 \\ 0 & 0 & 0 & 0 \end{bmatrix} \begin{matrix} C_2 - 3C_1 \\ C_1 - 4C_1 \\ C_4 - 3C_1 \end{matrix}$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & -6 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$ Swip C_4 with C_2

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -6 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$ Divid C_2 by -6

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

Rank = 2

Question No 2

Find the Inverse of $A = \begin{bmatrix} 3 & 4 & 5 \\ 2 & -1 & 4 \\ 5 & -2 & 7 \end{bmatrix}$

by adjoint Method.

$$A^{-1} = \frac{1}{|A|} \text{adj } A$$

by this formula we find $|A|$

$$|A| = 3\begin{vmatrix} -1 & 4 \\ -2 & 7 \end{vmatrix} - 4\begin{vmatrix} 2 & 4 \\ 5 & 7 \end{vmatrix} + 5\begin{vmatrix} 2 & -1 \\ 5 & -2 \end{vmatrix}$$

$$= 3(-7+8) - 4(14-20) + 5(-4+5)$$

$$= 3 + 24 + 5$$

$$|A| = 32$$

Now adj A by co-factor Method

Directly by Rough work

$$\text{adj } A \begin{bmatrix} 1 & 6 & 1 \\ -38 & -4 & 26 \\ 21 & -2 & -9 \end{bmatrix}$$

3

$$\begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & -4 \\ 0 & 1 & -2 \end{bmatrix} \quad R_2/2$$

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

Rank of $A = 3$

Now Rank of AB

$$\left[\begin{array}{ccc|c} 1 & -1 & 1 & 0 \\ 0 & 2 & 8 & 8 \\ 5 & 0 & -5 & 10 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & -1 & 0 & 0 \\ 0 & 2 & 8 & 8 \\ 0 & 5 & -10 & 10 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & -1 & 0 & 0 \\ & & 8 & 8 \\ 0 & 2 & & \\ 0 & 0 & -5 & 10 \end{array}\right]$$

So the Rank of $AB = 3$

So the Question is Consistence.

Question No 1

$$\begin{aligned} x_1 - 3x_2 + x_3 &= 0 \\ 2x_2 - 8x_3 &= 0 \\ 5x_1 \quad - 5x_3 &= 0 \end{aligned}$$

Sol

To Find A

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

$$\begin{bmatrix} 1 & -3 & 1 \\ 0 & 2 & -8 \\ 5 & 0 & 5 \end{bmatrix} \quad R_3 + (-5R_1)$$

$$\begin{bmatrix} 1 & -3 & 1 \\ 0 & 2 & -8 \\ 0 & 1 & -2 \end{bmatrix} \quad R_3/5$$

$$\text{adj } a \begin{bmatrix} 1 & -38 & 21 \\ 6 & -4 & -2 \\ 1 & 26 & -9 \end{bmatrix}$$

by formula

$$A^{-1} = \frac{1}{32} \begin{vmatrix} 1 & -38 & 21 \\ 6 & -4 & -2 \\ 1 & 26 & -9 \end{vmatrix}$$

Ans