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I.D : 16630

Programe : Bs (SE-II) section B

Instructer : Sir Dr. Shakeel Khan.

Q No : 01 :

Solution :

$$x_1 - (3^{rd} - ID)x_2 + x_3 = 0$$
$$2x_2 - 8x_3 = 8$$
$$5x_1 - 5x_3 = 10$$

$$x_1 - 6x_2 + x_3 = 0$$
$$2x_2 - 8x_3 = 8$$
$$5x_1 - 5x_3 = 10$$

$\downarrow$

As Augmented matrix

$$\begin{bmatrix} 1 & -6 & 1 & 0 \\ 0 & 2 & -8 & 8 \\ 5 & 0 & -5 & 10 \end{bmatrix}$$

Two way to find where the system is Consistance or not

P(2)

15
8
120

4

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$$\begin{bmatrix} 1 & -6 & 1 & 0 \\ 0 & 2 & -8 & 8 \\ 0 & 30 & -10 & 10 \end{bmatrix} \quad R_3 - 5R_1$$

$$\begin{array}{cccc} \cancel{5} & 0 & -5 & 10 \\ \cancel{5} & -30 & 5 & 0 \\ \hline 0 & 30 & -10 & 10 \end{array}$$

$$\begin{bmatrix} 1 & -6 & 1 & 0 \\ 0 & 2 & -8 & 8 \\ 0 & 0 & 110 & -110 \end{bmatrix} \quad R_3 - 15R_2$$

$$\begin{array}{cccc} 0 & 30 & -10 & 10 \\ 0 & -30 & +120 & -120 \\ \hline 0 & 0 & 110 & -110 \end{array}$$

$$x_1 - 6x_2 + x_3 = 0$$

$$0x_1 + 2x_2 - 8x_3 = 8$$

$$0x_1 + 0x_2 + 110x_3 = -110$$

$$x_1 - 6x_2 + x_3 = 0 \quad \text{—(i)}$$

$$2x_2 - 8x_3 = 8 \quad \text{—(ii)}$$

$$110x_3 = -110 \quad \text{—(iii)}$$

$$x_3 = \frac{\cancel{-110}}{\cancel{110}}$$

$$\boxed{x_3 = -1} \longrightarrow \text{putt in eq (2)}$$

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$2x_2 - 8(-1) = 8$

$2x_2 + 8 = 8$

$\boxed{x_2 = 0}$ put in eq(i)

$x_1 - 6(0) + -1 = 0$

$x_1 - 0 - 1 = 0$

$\boxed{x_1 = 1}$

$(x_1, x_2, x_3) = (1, 0, -1)$

so it is consistence.

P(4)

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Q No: 02

Solution:

inverse of $A = \begin{bmatrix} 3 & 4 & 5 \\ 2 & -1 & 4^{th} \text{ I.D} \\ 5 & -2 & 7 \end{bmatrix}$

by adjoint method.

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

To Find determinant expend By R_1

~~|A|~~ =

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

$$|A| = 3(-7+6) - 4(14-15) + 5(-4+5)$$

$$|A| = -3 + 4 + 5 = 6 \neq 0$$

So invers can exist.

P(5)

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

To Find adj A.

$$a_{11} = (-1)^{1+1} \begin{vmatrix} -1 & 3 \\ -2 & 7 \end{vmatrix} = 1(-7+6) = \boxed{-1}$$

$$a_{12} = (-1)^{1+2} \begin{vmatrix} 2 & 3 \\ 5 & 7 \end{vmatrix} = -1(14-15) = \boxed{1}$$

$$a_{13} = (-1)^{1+3} \begin{vmatrix} 2 & -1 \\ 5 & -2 \end{vmatrix} = 1(-4+5) = \boxed{1}$$

$$a_{21} = (-1)^{2+1} \begin{vmatrix} 4 & 5 \\ -2 & 7 \end{vmatrix} = -1(28+10) = \boxed{-38}$$

$$a_{22} = (-1)^{2+2} \begin{vmatrix} 3 & 5 \\ 5 & 7 \end{vmatrix} = 1(81-25) = \boxed{56}$$

$$a_{23} = (-1)^{2+3} \begin{vmatrix} 3 & 4 \\ 5 & -2 \end{vmatrix} = -1(-6-20) = \boxed{26}$$

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$a_{31} = (-1)^{3+1} \begin{vmatrix} 4 & 5 \\ -1 & 3 \end{vmatrix} = 1(12+5) = \boxed{17}$

$a_{32} = (-1)^{3+2} \begin{vmatrix} 3 & 5 \\ 2 & 3 \end{vmatrix} = -1(9-10) = \boxed{1}$

$a_{33} = (-1)^{3+3} \begin{vmatrix} 3 & 4 \\ 2 & -1 \end{vmatrix} = 1(-3-8) = \boxed{-11}$

$$A^{-1} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}^t$$

$$\sim A^{-1} = \begin{bmatrix} -1 & 1 & 1 \\ -38 & 56 & 26 \\ 17 & 1 & -11 \end{bmatrix}^t$$

P.T.O

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$$A^{-1} = \begin{bmatrix} -1 & -38 & 17 \\ 1 & 56 & 1 \\ 1 & 26 & -11 \end{bmatrix}$$

it is required answer.

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Q No: 03

Solution:

$$2x + 2y + 4z = 18$$

$$x + 3y + 2z = 13$$

$$3x + y + 3z = 14$$

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

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

$$\begin{bmatrix} 1 & 1 & 2 & 9 \\ 0 & 2 & 0 & 4 \\ 0 & -2 & -3 & -13 \end{bmatrix} \quad \frac{1}{2}R_2$$

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$$\begin{bmatrix} 1 & 1 & 2 & 9 \\ 0 & 1 & 0 & 2 \\ 0 & -2 & -3 & -13 \end{bmatrix} \quad R_3 + 2R_2$$

$$\begin{bmatrix} 1 & 1 & 2 & 9 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & -3 & -9 \end{bmatrix} \quad \begin{matrix} R_1 - R_2 \\ -1/3\, R_3 \end{matrix}$$

$$\begin{bmatrix} 1 & 0 & 2 & 7 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{bmatrix} \quad R_1 - 2R_3$$

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{bmatrix} \begin{matrix} \to x \\ \to y \\ \to z \end{matrix}$$

Solution:

$x = 1, \quad y = 2, \quad z = 3$

$(x, y, z) = (1, 2, 3)$

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Q.No: 04

Solution:

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

Eigenvalues of A are $= 4, -3, 1$

$\because$ The algebric multiplicity of

eigen values 4 is 1, -3, is 1

1 is 1.

$G.M = n - \text{Rank}(A - \lambda I)$

so

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

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

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Take a minor

$$\begin{bmatrix} 2 & -2 \\ -5 & 2 \end{bmatrix} \neq 0 \Rightarrow \text{Ran} = 2$$

$\therefore$ G.M = $3 - 2 = 1$

A.M $\neq$ G.M

$2 \neq 1$

Hence A is not diagonalizable.

D(12)

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Q No: 05

Sol:

$$3x_1 + 5x_2 - 4x_3 = 0$$

$$-3x_1 - 25x_2 + 4x_3 = 0$$

$$6x_1 + x_2 - 8x_3 = 0$$

In Matrix form

$$Ax = 0$$

$$A = \begin{bmatrix} 3 & 5 & -4 \\ 3 & -25 & -4 \\ 6 & 1 & -8 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$|A| = \begin{vmatrix} 3 & 5 & -4 \\ 3 & -25 & -4 \\ 6 & 1 & -8 \end{vmatrix}$$

$$3\begin{vmatrix} -25 & -4 \\ 1 & -8 \end{vmatrix} - 5\begin{vmatrix} 3 & -4 \\ 6 & -8 \end{vmatrix} - 4\begin{vmatrix} 3 & -25 \\ 6 & 1 \end{vmatrix}$$

P(13)

Altaf Hussain $\frac{25}{\frac{8}{200}}$ 4 $\frac{\frac{153}{4}}{612}$ I.D: 166

$3(200+4)-5(-24+24)-4(3+150)$

$= 612-612 = 0$

So

$|A| = 0$

Therefore A is a singular matrix & have infinite

and ~~non~~ many solution.

P(14)

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Solution:

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

$$\begin{bmatrix} 1 & 3 & 4 & 3 \\ 0 & 0 & 0 & -6 \\ 0 & 0 & 0 & -2 \end{bmatrix} \begin{matrix} R_2 \to 3R_1 \\ R_3 - R_1 \end{matrix}$$

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

$\downarrow$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -6 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \to$$ two Column are Zero

So Rank = 2