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ID NO: 15958

SUBMITTED TO: M. SHAKEEL SB.

COURCE NAME: LINEAR ALGEBRA

DEPARTMENT: BS SOFTWARE ENGINEERING

SEMESTER: 2nd

SECTION: "A"

FINAL TERM.

Q.No: 1

Solution:

ID = 15958

$ID_3 = 9$

Putting in equation

$$x_1 - 9x_2 \quad x_3 = 0$$
$$2x_2 - 8x_3 = 8$$
$$5x_1 \quad -5x_3 = 10$$

Now changing in matrix form.

$$\left[\begin{array}{ccc|c} 1 & -9 & 1 & 0 \\ 0 & 2 & -8 & 8 \\ 5 & 0 & -5 & 10 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & -9 & 1 & 0 \\ 0 & 1 & -4 & 4 \\ 0 & 0 & -10 & 3 \end{array}\right] \quad \tfrac{1}{2} R_2 + 3R_3$$

$$\left[\begin{array}{ccc|c} 1 & -9 & 1 & 0 \\ 0 & 1 & -4 & 4 \\ 0 & 0 & 10 & 3 \end{array}\right] \quad \tfrac{1}{2} R_3$$

0

0 0

This is perfect triangle

Hence consistent.

Q. 02
Solution:

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

ID = 15958
ID4 = 5

Let $Ab = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$

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

First we find cofactor of every element of A.

$$A_{11} = (-1)^{1+1} \begin{vmatrix} -1 & 5 \\ -2 & 7 \end{vmatrix}$$

$$= 1 \cdot (-7 - (-10)) = 1 \cdot (-7 + 10)$$

$$\boxed{A_{11} = 3}$$

$$A_{12} = (-1)^{1+2} \begin{bmatrix} 2 & 5 \\ 5 & 7 \end{bmatrix}$$

$$= -1 \cdot (14 - 25)$$

$$\boxed{A_{12} = 11}$$

$$A_{13} = (-1)^{1+3} \begin{bmatrix} 2 & -1 \\ 5 & -2 \end{bmatrix}$$

$$= 1 \cdot (-4 - (-5)) = 1 \cdot (-4 + 5)$$

$$\boxed{A_{13} = 1}$$

P-T-O

$A_{21} = (-1)^{2+1}$

$$\begin{bmatrix} 4 & 5 \\ -2 & 7 \end{bmatrix}$$

$= -1.(28-(-10)) = -1.(28+10)$

$\boxed{A_{21} = -38}$

$A_{22} = (-1)^{2+2}$

$$\begin{bmatrix} 3 & 5 \\ 5 & 7 \end{bmatrix}$$

$= 1.(21-25)$

$\boxed{A_{22} = -4}$

$A_{23} = (-1)^{2+3}$

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

$= -1 (-6 - 20)$

$\boxed{A_{23} = 26}$

$A_{31} = (-1)^{3+1}$

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

$= 1.(20-(-5)) = 1.(20+5)$

$\boxed{A_{31} = 25}$

$A_{32} = (-1)^{3+2} \begin{bmatrix} 3 & 5 \\ 2 & 5 \end{bmatrix}$

$= -1.(15-10)$

$\boxed{A_{32} = -5}$

P-T-O

$A_{33} = (-1)^{3+3}$
$$\begin{bmatrix} 3 & 4 \\ 2 & -1 \end{bmatrix}$$
$= 1(-3-8)$

$\boxed{A_{33} = -11}$

$$Ab = \begin{bmatrix} 3 & 11 & 1 \\ -38 & -4 & 26 \\ 25 & -5 & -11 \end{bmatrix}$$

$Adj\ A = (Ab)^t$

$$Adj\ A = \begin{bmatrix} 3 & -38 & 25 \\ 11 & -4 & -5 \\ 1 & 26 & -11 \end{bmatrix}$$ Ans

Q.3:
Solution

Gauss - Jordan Method

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

$$\left[\begin{array}{ccc|c} 2 & 2 & 4 & 18 \\ 1 & 3 & 2 & 13 \\ 3 & 2 & -3 & 14 \end{array}\right] \times (1/2)$$

$$R_1/2 \rightarrow R_2$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 2 & 9 \\ 1 & 3 & 2 & 13 \\ 3 & 2 & -3 & 14 \end{array}\right] \times (1/2)$$

$$R_2 - 1 \times R_1 \rightarrow R_2$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 2 & 9 \\ 0 & 2 & 0 & 4 \\ 3 & 2 & -3 & 14 \end{array}\right] \times (-3)$$

$$R_3 - 3 \times R_1 \rightarrow R_3$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 2 & 9 \\ 0 & 2 & 0 & 4 \\ 0 & -1 & -9 & -13 \end{array}\right]$$

P.T.O

$R_2/2 \rightarrow R_2$

$$\left[\begin{array}{ccc|c} 1 & 1 & 2 & 9 \\ 0 & 1 & 0 & 2 \\ 0 & -1 & -9 & -13 \end{array}\right] \times (1)$$

$R_3 - (-1) \times R_2 \rightarrow R_3$

$$\left[\begin{array}{ccc|c} 1 & 1 & 2 & 9 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & -9 & 11 \end{array}\right] \times (-1/9)$$

$R_3/{-9} \rightarrow R_3$

$$\left(\begin{array}{ccc|c} 1 & 1 & 2 & 9 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 11/9 \end{array}\right)$$

$R_1 - 2 \times R_3 \rightarrow R_1$

$$\left(\begin{array}{ccc|c} 1 & 1 & 0 & -59/9 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 11/9 \end{array}\right) \times (-1)$$

Ans

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Q 4
Solution

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

$A = CDC^{-1}$
let $(A - \lambda I_3) = u$

$$A - \lambda I_3 = \begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix} - \begin{bmatrix} \lambda & 0 & 0 \\ 0 & \lambda & 0 \\ 0 & 0 & \lambda \end{bmatrix}$$

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

$$= 4-\lambda \begin{vmatrix} 3-\lambda & 2 \\ 4 & 1-\lambda \end{vmatrix} -2 \begin{vmatrix} -5 & 2 \\ -2 & 1-\lambda \end{vmatrix} -2 \begin{vmatrix} -5 & 3-\lambda \\ -2 & -4 \end{vmatrix}$$

$= 4-\lambda((3-\lambda)(1-\lambda)-8)-2(-5(1-\lambda)+4)-2(-20+2(3-\lambda)=0$
$= 4-\lambda[3-3\lambda-\lambda+\lambda^2-8]-2[-5+5\lambda+4]-2[-20+6-2\lambda]=0$
$= 4-\lambda[\lambda^2-4\lambda-5]-2[5\lambda-1]-2[-14-2\lambda]=0$

$= 4\lambda^2+16\lambda-26-\lambda^3+4\lambda^2+5\lambda-10\lambda+2+28+4\lambda=0$

$= -\lambda^3+8\lambda^2+15\lambda+10=0$
$\lambda = 9.65$
$\lambda = 0.82$
$\lambda = -0.829$
for $\lambda = -965$
P. 1 ... P-T-O

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$$A \cdot \lambda I_3 = \begin{bmatrix} 4.82 & 2 & -2 \\ -5 & 3.82 & 2 \\ -2 & 4 & 1.82 \end{bmatrix}$$

For $A = -0.82$

$$A - \lambda I_3 = \begin{bmatrix} 4.82 & 2 & -2 \\ -5 & 3.82 & 2 \\ -2 & 4 & 1.82 \end{bmatrix}$$

In end only one 1 eigespe- or 2 basis necte. are tast.

So matrix A is not diagonisable.

Q5 $3x_1 + 5x_2 - 4x_3 = 0$ — ①
$-3x_1 - 25x_2 + 4x_3 = 0$ — ②
$6x_1 - 1x_2 - 8x_3 = 0$ — ③

Solution

$$A = \begin{bmatrix} 3 & 5 & -4 \\ -3 & -15 & 4 \\ 6 & 1 & -8 \end{bmatrix} x \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Add eq4 ① and ②

$$3x1 + 5x2 - 4x3 = 0$$
$$-3x1 - 25x_2 + 4x_3 = 0$$

$$-20x_2 = 0$$
$$x_2 = 0$$

Add eq4 ① and 3

$$3x_1 + 5x_2 - 4x_3 = 0$$
$$6x1 + x_2 - 8x_3 = 0$$

$$9x_1 + 6x_2 - 12x_3 = 0$$

$$9x_1 = 12x_3$$

$$x_1 = \frac{4}{3} x_3$$

$$\begin{bmatrix} x_1 = 4x_3 \\ x_2 = 0 \\ x_3 = \beta \end{bmatrix}$$

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Q6 $A = \begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 0 \end{bmatrix}$

Maximum possible rank for matrix

A i) 3 if

$[A] = 0$

rank no of non zeros

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

$R_3 - R_1$

$1 - 1 = 0$

$3 - 3 = 0$

$4 - 4 = 0$

$0 - 3 = \bar{3}$

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

$A = \begin{bmatrix} 1 & 3 & 4 & 3 \\ 1 & 3 & 4 & 3 \\ 0 & 0 & 0 & -3 \end{bmatrix}$ $R_2/3$

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

$R_2 = R$

$1 - 1 = 0$

$3 - 3 = 0$

$4 - 4 = 0$

$3 - 3 = 0$