(8)

solution:

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

Reduce matrix to reduced row-echilor form.

Swap matrix wow $R_1 \leftrightarrow R_2$

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

cancel leading co-efficient in row ~~R2~~ by performing

$$R_2 \leftarrow R_2 - \tfrac{1}{3} R1$$

$$= \begin{bmatrix} 3 & 9 & 12 & 3 \\ 0 & 0 & 0 & 2 \\ 1 & 3 & 4 & 0 \end{bmatrix}$$

(9)

Canckl leading co-efficient in Row by perfoming

$$R_3 = R_2 = 1/3 \, R_1$$

$$\begin{bmatrix} 3 & 9 & 12 & 3 \\ 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

Rank of a matrix in the number of all Zero row

Rank of

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

$$= 2.$$

QNO 6 :- Diagnosible.

$$\begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -\text{[illegible]} & 4 & 1 \end{bmatrix}$$

(10)

Solution:

matrix A is diagnosible is

$A = CDC^{-1}$

let $(A - \lambda I) = 0$

$$A - \lambda I = \begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 11 & 1 \end{bmatrix} - \begin{bmatrix} \lambda & 0 & 0 \\ 0 & \lambda & 0 \\ 0 & 0 & \lambda \end{bmatrix}$$

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

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

$$\begin{vmatrix} -5 & 3-\lambda \\ -2 & -4 \end{vmatrix} = 0$$

(11)

$\Rightarrow 4-\lambda\,(3-\lambda)\,(1-\lambda)-8) - 2(-5(1-\lambda)+4)$
$-2\,(-20 + 2(3-\lambda) = 0$

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

$\Rightarrow 4-\lambda(\lambda^2 - 4\lambda - 5] - 2[5\lambda - 1] - 2[\cancel{-14}-2\lambda]$
$= 0$

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

$\Rightarrow -\lambda^3 + 8\lambda^2 + 15\lambda + 10 = 0$

$\lambda = 9.65$

$\lambda = -0.82$

$\lambda = -0.829$

for $\lambda = 9.65$

$$A - \lambda + 3 \begin{bmatrix} -5+65 & 2 & -2 \\ -5 & -6-65 & 2 \\ -2 & 4 & -8-65 \end{bmatrix}$$

for $A = 0.82$

$$A - \lambda \pm 3 = \begin{bmatrix} 4-82 & 2 & -2 \\ -5 & 3-82 & 2 \\ -2 & 4 & 1-82 \end{bmatrix}$$

by solving only 2 eigenspace
or 2 vector in total

so matrix A is not
diagnosizable.

The END

Nome:: Malik Osama Wa...

Id = 16048

(1)

Subject = linear Algebra.

Q no 1:: $x_1 - (3^{rd} - 1D)x_2 + x_3 = 0$

$2x_2 - 8x_3 = 8$

$5x_1 - 5x_3 = 10$

3rd = 0

Sol.

$x_1 - (0)x_2 + x_3 = 0$

$2x_2 - 8x_3 = 8$

$5x_1 - 5x_3 = 10$

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

$$\left[\begin{array}{ccc:c} 1 & 0 & 1 & 0 \\ 0 & 1 & -4 & 4 \\ 0 & 4 & -1 & 1 \end{array}\right] \begin{array}{l} R_2/4 \\ R_3/10 \end{array}$$

$$\left[\begin{array}{ccc:c} 1 & 0 & 1 & 0 \\ 0 & 1 & -4 & 4 \\ 0 & 0 & -15 & -15 \end{array}\right]$$

$R_3 - 4R_2$

2

Constant because of the triangle

$$-15x_3 = -15$$

$$x_3 = 1$$

$$x_2 - 4x_3 = 4$$

$$x_2 = 4 + 4x_3$$

$$x_2 = 8$$

$$x_1 = 0 \quad + x_3 = 0$$

$$x_1 = 0 - x_3$$

$$x_1 = 0 - 1$$

$$x_1 = -1$$

Q No 2:-

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

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

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

Sol:-

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

(3)

$$\begin{bmatrix} 1 & 1 & 2 & 9 \\ 1 & 3 & 2 & 13 \\ 3 & 1 & 3 & 14 \end{bmatrix}$$

$R_2 = R_2 - R_1$
$R_3 = R_3 - 3R_1$

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

$$\begin{bmatrix} 1 & 1 & 2 & 9 \\ 0 & 1 & 0 & 2 \\ 0 & -2 & -3 & -13 \end{bmatrix}$$

$R_3 = R_3 + 2R_2$

$$\begin{bmatrix} 1 & 1 & 2 & 9 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & -3 & -9 \end{bmatrix}$$

$R_1 = R_1 - R_2$
$R_3 = -\tfrac{1}{3} R_3$

$$\begin{bmatrix} 1 & 0 & 2 & 7 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

$R_1 = R$

(4)

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

$$\Rightarrow \left.\begin{aligned} x &= 1 \\ y &= 2 \\ z &= 3 \end{aligned}\right\} \text{Solution}$$

So $z = 3$

ID = 16048

Q NO 3 :-

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

Sol:-

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

$$A^{-1} = \frac{1}{|A|} \text{Adj}(A)$$

(5)

$|A| = 3[-7-(-8)] - 4[14-20] + 5[-4-(-5)]$

$|A| = 3[1] - 4[-6] + 5[1]$

$|A| = 32$

cofactors:

$3 = [1] \quad 4 = [6] \quad 5 = [1] \quad 2 = [-38$

$-1 = [4] \quad 4 = [-1] \quad 5 = [11] \quad -2 = [-4]$

$7 = [9]$

$$= \begin{bmatrix} 1 & 6 & 1 \\ -38 & 4 & -1 \\ 11 & -4 & 9 \end{bmatrix}$$

Transpose

$$\begin{bmatrix} 1 & 6 & 1 \\ -38 & 4 & -1 \\ 11 & -4 & 9 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & -38 & 11 \\ 6 & 4 & -4 \\ 1 & -4 & 9 \end{bmatrix}$$

6

$$A^{-1} = \frac{1}{32} \times \begin{bmatrix} 1 & -38 & 11 \\ 6 & 4 & -7 \\ 1 & -4 & 9 \end{bmatrix}$$

Q No 4 =

$$3x_1 + 5x_2 - 4x_3 = 0$$
$$-3x_1 - 2x_2 + 4x_3 = 0$$
$$6x_1 + x_2 - 8x_3 = 0$$

Solution:-

$$\left[\begin{array}{ccc|c} 3 & 5 & -4 & 0 \\ -3 & -2 & 4 & 0 \\ 6 & 1 & -8 & 0 \end{array}\right]$$

$$\sim \left[\begin{array}{ccc|c} 1 & \frac{5}{3} & -\frac{4}{3} & 0 \\ -3 & -2 & 4 & 0 \\ 6 & 1 & -8 & 0 \end{array}\right]$$

$$\sim \left[\begin{array}{ccc|c} 1 & 5/3 & -4/3 & 0 \\ 0 & 3 & 0 & 0 \\ 0 & -9 & 0 & 0 \end{array}\right]$$

7

$$\sim \left[\begin{array}{ccc|c} 1 & 5/3 & -4/3 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -4 & 0 & 0 \end{array}\right]$$

$$\sim \left[\begin{array}{ccc|c} 1 & 0 & -4/3 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right]$$

So, we have a solution of

$$x = \begin{bmatrix} 4/3\,8 \\ 0 \\ 8 \end{bmatrix} = 8 \begin{bmatrix} 4/3 \\ 0 \\ 1 \end{bmatrix}$$

Q No 8:

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