Assignment # 01

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PROGRAM : BSE
SECTION : 2B
ENR NO : 02-131212-049
Subject : Linear Algebra.

Q1 Find the Solution Set of the given System of eq by gauss Jordon method.

$$x_1 - 5x_2 + 2x_3 - x_4 = 3$$
$$-2x_1 + 10x_2 + 2x_3 - x_4 = -1$$
$$x_2 - 3x_3 + 4x_4 = 2$$

Sol

write in Augmented form.

$$\left[\begin{array}{cccc|c} 1 & -5 & 2 & -1 & 3 \\ -2 & 10 & 2 & -1 & -1 \\ 0 & 1 & -3 & 4 & 2 \end{array}\right]$$

$R_2 + 2R_1$

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

$R_2 \leftrightarrow R_3$ (Row elimentary method).

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

$2-15$
$-1+20$
$3+10$

$R_1 + 5R_2$

$$\left[\begin{array}{cccc|c} 1 & 0 & -13 & 19 & 13 \\ 0 & 1 & -3 & 4 & 2 \\ 0 & 0 & 6 & -3 & 5 \end{array}\right].$$

$2R_2 + R_3$, $6R_1 + 13R_3$.

$$\left[\begin{array}{ccc|c|c} 6 & 0 & 0 & 75 & 143 \\ 0 & 2 & 0 & 5 & 9 \\ 0 & 0 & 6 & -3 & 5 \end{array}\right]$$

$R_1 \div 6$, $R_2 \div 2$, $R_3 \div 6$

a	b	c	d	
(1)	0	0	12.5	23.8
0	(1)	0	2.5	4.5
0	0	(1)	-0.5	0.83

let $d = 1$ ← free column.

$R_1 \Rightarrow \quad a + 12.5d = 23.8$

$R_2 \Rightarrow \quad b + 2.5d = 4.5$

$R_3 \Rightarrow \quad c + (-0.5d) = 0.83$

Put $d = 1$ in R_1

$a + 12.5 = 23.8$

$\boxed{a = 11.3}$

Put $d = 1$ in R_2.

$b + 2.5 = 4.5$

$\boxed{b = 2}$

Put $d = 1$ in R_3

$c - 0.5 = 0.83$

$\boxed{c = 1.33}$

Solution Set

$$\begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix} = \begin{bmatrix} 11.3 \\ 2 \\ 1.33 \\ 1 \end{bmatrix}$$

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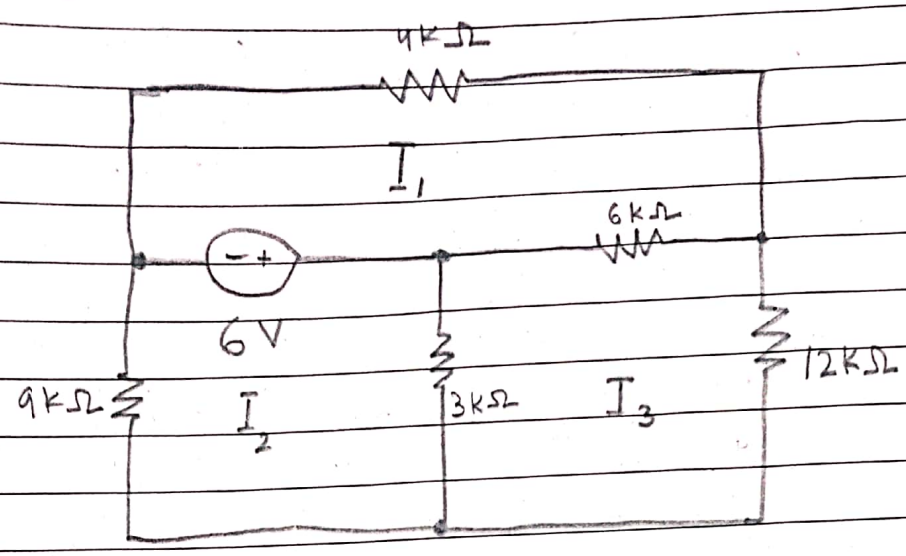
Q2 Solve the given circuit by Row ~~el~~ echelon (gauss elimination) form.



$$10I_1 + 0 - 6I_3 = 6$$
$$0 + 12I_2 - 3I_3 = 6$$
$$-6I_1 - 3I_2 + 21I_3 = 0$$

write in Augmented form

$$\left[\begin{array}{ccc|c} 10 & 0 & -6 & 6 \\ 0 & 12 & -3 & 6 \\ -6 & -3 & 21 & 0 \end{array}\right]$$

$R_1 \div 2$, $R_2 \div 3$, $R_3 \div 3$

$$\left[\begin{array}{ccc|c} 5 & 0 & -3 & 3 \\ 0 & 4 & -1 & 2 \\ -2 & -1 & 7 & 0 \end{array}\right]$$

$5R_3 + 2R_1$

$$\left[\begin{array}{ccc|c} (5) & 0 & -3 & 3 \\ 0 & (4) & -1 & 2 \\ 0 & -5 & (29) & 6 \end{array}\right]$$

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$4R_3 + 5R_2$

x_1	x_2	x_3	
5	0	-3	3
0	4	-1	2
0	0	111	34

$-20+20$

$R_3 \Rightarrow \quad 111x_3 = 34$

$$\boxed{x_3 = 0.30}$$

$R_2 \Rightarrow \quad 4x_2 - 0.30 = 2$

$4x_2 = 2.3$

$$\boxed{x_2 = 0.57}$$

$R_1 \Rightarrow \quad 5x_1 - 3(0.30) = 3$

$5x_1 - 0.9 = 3$

$5x_1 = 3.9$

$$\boxed{x_1 = 0.78}$$

Solution Set :-

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0.78 \\ 0.57 \\ 0.30 \end{bmatrix}$$

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3. Determine the value of h such that the given matrix is augmented matrix of a consistent linear system.

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

Sol: write in Augmented matrix

$$\left[\begin{array}{cc|c} 2 & h & 1 \\ -3 & 4 & 2 \end{array}\right]$$

$2R_2 + 3R_1$

$$\left[\begin{array}{cc|c} 2 & h & 1 \\ 0 & 8+3h & 7 \end{array}\right]$$

If

$8 + 3h \neq 0$

$3h \neq -8$

$h \neq -\frac{8}{3}$.

For any real values except $h \neq -\frac{8}{3}$ the given matrix is of a consistent linear equation.

2) $\begin{bmatrix} -4 & 3 & 2h \\ 2 & -3/2 & 2 \end{bmatrix}$.

Sol:

$2R_2 + R_1$.

$$\left[\begin{array}{cc|c} -4 & 3 & 2h \\ 0 & 0 & 4+2h \end{array}\right]$$

If $4 + 2h = 0$

$2h = -4$

$h = -2$

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when value of h is −2 the System is of linear combination otherwise the System is not of linear combination.

Q4 For what value of "h" the given v is a linear combination of b_1, b_2, b_3.

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

$R_2 + 2R_1$ and $R_3 + 3R_1$

$$\left[\begin{array}{ccc|c} 1 & -3 & 1 & h \\ 0 & 0 & 0 & 2+2h \\ 0 & -9 & 8 & 3+3h \end{array}\right]$$

$R_2 \leftrightarrow R_3$ (Row elimentary method)

$$\left[\begin{array}{ccc|c} 1 & -3 & 1 & h \\ 0 & -9 & 8 & 3+3h \\ 0 & 0 & 0 & 2+2h \end{array}\right]$$

for

$$2 + 2h = 0$$

$$2h = -2$$

$$\boxed{h = -1}$$

When $h = -1$ the System is a linear combination and for all other values of h the System is not of linear combination.