Method ii Gauss-Jordan Method.

change A to unit Matrix (or) Diagonal Matrix.

1) Solve $x+3y+3z=16$; $x+4y+3z=18$; $x+3y+4z=$
by Gauss-Jordan Method.

Solution:

The augmented Matrix (A, B)

$$\sim \left(\begin{array}{ccc|c} 1 & 3 & 3 & 16 \\ 1 & 4 & 3 & 18 \\ 1 & 3 & 4 & 19 \end{array}\right)$$

$$\sim \left(\begin{array}{ccc|c} 1 & 3 & 3 & 16 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{array}\right) \quad \begin{array}{l} R_2 \to R_2 - R_1 \\ R_3 \to R_3 - R_1 \end{array}$$

[1st row 1st col = 1, 1st column - all other entries zero]

$$\sim \left(\begin{array}{ccc|c} 1 & 0 & 3 & 10 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{array}\right) \quad R_1 \to R_1 - 3R_2$$

[2nd row 2nd elt → 1 all other entries zero]

$$\sim \left(\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{array}\right)$$

[3rd row 3rd elt → 1 all other entries zero]

Now $A \simeq$ Identity Matrix.

$$\therefore \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$$

$\Rightarrow x = 1$; $y = 2$; $z = 3$ //

2) Using Gauss - Jordan Method solve the following equations

$$10x + y + z = 12$$
$$2x + 10y + z = 13$$
$$x + y + 5z = 7$$

Solution:

The augmented Matrix $(A, B) \simeq \left(\begin{array}{ccc|c} 10 & 1 & 1 & 12 \\ 2 & 10 & 1 & 13 \\ 1 & 1 & 5 & 7 \end{array}\right)$

$$\simeq \left(\begin{array}{ccc|c} 1 & 1/10 & 1/10 & 12/10 \\ 2 & 10 & 1 & 13 \\ 1 & 1 & 5 & 7 \end{array}\right) \quad R_1 \to R_1 \div 10$$

$$\simeq \left(\begin{array}{ccc|c} 1 & 1/10 & 1/10 & 12/10 \\ 0 & 98/10 & 8/10 & 106/10 \\ 0 & 9/10 & 49/10 & 58/10 \end{array}\right) \quad \begin{array}{l} R_2 \to R_2 - 2R_1 \\ R_3 \to R_3 - R_1 \end{array}$$

$10 - \frac{2}{10}$

$1 - 2/10$

$13 - 24/10$

$$\simeq \left(\begin{array}{ccc|c} 1 & 1 & 5 & 7 \\ 2 & 10 & 1 & 13 \\ 10 & 1 & 1 & 12 \end{array}\right) \quad \begin{array}{l} R_1 \to R_3 \\ R_3 \to R_1 \end{array}$$

$$\simeq \left(\begin{array}{ccc|c} 1 & 1 & 5 & 7 \\ 0 & 8 & -9 & -1 \\ 0 & -9 & -49 & -58 \end{array}\right) \quad \begin{array}{l} R_2 \to R_2 - 2R_1 \\ R_3 \to R_3 - 10R_1 \end{array}$$

$$\simeq \left(\begin{array}{ccc|c} 1 & 1 & 5 & 7 \\ 0 & 1 & -9/8 & -1/8 \\ 0 & -9 & -49 & -58 \end{array}\right) \quad R_2 \to R_2/8$$

$$\simeq \left(\begin{array}{ccc|c} 1 & 1 & 5 & 7 \\ 0 & 1 & -9/8 & -1/8 \\ 0 & 0 & -473/8 & -473/8 \end{array}\right) \quad R_3 \to R_3 + 9R_2$$

$-49 - \frac{81}{8}$

$\frac{-392 - 81}{8}$ $\frac{473}{8}$

$-58 - \frac{9}{8}$

$-464 - 9$

$$\simeq \left(\begin{array}{ccc|c} 1 & 1 & 5 & 7 \\ 0 & 1 & -9/8 & -1/8 \end{array}\right.$$

$R_3 \to R_3 \div \frac{-473}{8}$

$$\simeq \left(\begin{array}{ccc|c} 1 & 0 & +\frac{49}{8} & \frac{57}{8} \\ 0 & 1 & -\frac{9}{8} & -\frac{1}{8} \\ 0 & 0 & 1 & 1 \end{array}\right) \quad R_1 \to R_1 - R_2$$

$+5+9/8$

$-40+9$

$7+1/8$

$$\simeq \left(\begin{array}{ccc|c} 1 & 0 & \frac{49}{8} & \frac{57}{8} \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \end{array}\right) \quad R_2 \to R_2 + \frac{9}{8} R_3$$

$\frac{-1}{8} + \frac{9}{8}$

$$\simeq \left(\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \end{array}\right) \quad R_1 \to R_1 - \frac{49}{8} R_3$$

$\frac{57}{8} - \frac{49}{8}$

$\frac{8}{8}$

$A \simeq$ Identity Matrix.

$\therefore \boxed{x = 1;\ y = 1;\ z = 1}$