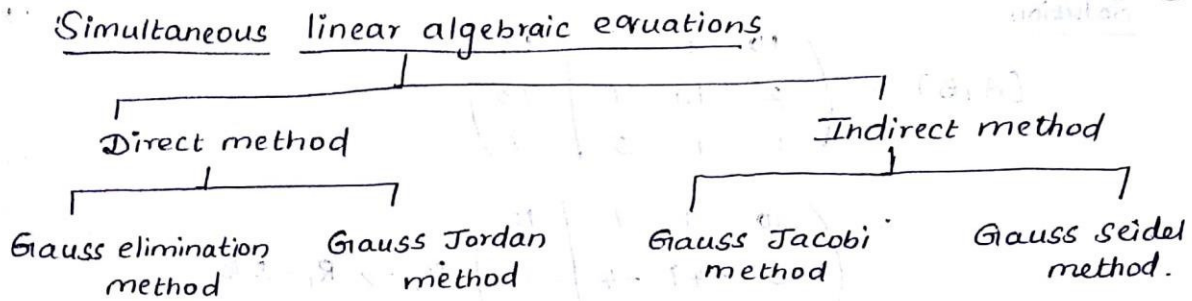




DEPARTMENT OF MATHEMATICS

③



Gauss elimination method :

① Solve $x + 3y + 3z = 16$, $x + 4y + 3z = 18$, $x + 3y + 4z = 19$
by Gauss elimination method.

Solution: Given :

$$\begin{aligned} x + 3y + 3z &= 16 \\ x + 4y + 3z &= 18 \\ x + 3y + 4z &= 19 \end{aligned}$$

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

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

By Back Substitution method,

$$\begin{aligned} \therefore z &= 3 \\ y &= 2 \end{aligned}$$

$$\begin{aligned} x + 3y + 3z &= 16 \\ x + 3(2) + 3(3) &= 16 \\ x &= 1 \end{aligned}$$

$$\therefore \boxed{x = 1, y = 2, z = 3}$$

Gauss Jordan method :

① Using Gauss Jordan method Solve the following equations : $10x + y + z = 12$, $2x + 10y + z = 13$, $x + y + 5z = 7$.



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Solution:

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

$$= \left(\begin{array}{ccc|c} 10 & 1 & 1 & 12 \\ 0 & -49 & -4 & -53 \\ 0 & -9 & -49 & -58 \end{array} \right) \begin{array}{l} R_2 \rightarrow R_1 - 5R_2 \\ R_3 \rightarrow R_1 - 10R_3 \end{array}$$

$$= \left(\begin{array}{ccc|c} 10 & 1 & 1 & 12 \\ 0 & 49 & 4 & 53 \\ 0 & 9 & 49 & 58 \end{array} \right) \begin{array}{l} R_2 / -1 \\ R_3 / -1 \end{array}$$

$$= \left(\begin{array}{ccc|c} 10 & 1 & 1 & 12 \\ 0 & 49 & 4 & 53 \\ 0 & 0 & -2365 & -2365 \end{array} \right) R_3 \rightarrow 9R_2 - 49R_3$$

$$= \left(\begin{array}{ccc|c} 10 & 1 & 1 & 12 \\ 0 & 49 & 4 & 53 \\ 0 & 0 & 1 & 1 \end{array} \right) R_3 / -2365$$

$$= \left(\begin{array}{ccc|c} -490 & 0 & -45 & -535 \\ 0 & 49 & 4 & 53 \\ 0 & 0 & 1 & 1 \end{array} \right) R_1 \rightarrow R_2 - 49R_3$$

$$= \left(\begin{array}{ccc|c} 490 & 0 & 45 & 535 \\ 0 & 49 & 4 & 53 \\ 0 & 0 & 1 & 1 \end{array} \right) R_1 / -1$$

$$= \left(\begin{array}{ccc|c} 490 & 0 & 0 & 490 \\ 0 & 49 & 0 & 49 \\ 0 & 0 & 1 & 1 \end{array} \right) \begin{array}{l} R_1 \rightarrow R_1 - 45R_3 \\ R_2 \rightarrow R_2 - 4R_3 \end{array}$$

$$\Rightarrow z = 1$$

$$49y = 49 \Rightarrow y = 1$$

$$490x = 490 \Rightarrow x = 1$$

The solution is
 $x = 1, y = 1, z = 1$