Ques → Find the maximum value of

$$Z = 107x_1 + x_2 + 2x_3 + 0x_4 + 0x_5 + 0x_6$$

s.t.

$$14x_1 + x_2 - 6x_3 + 3x_4 = 7$$
$$16x_1 + x_2 - 6x_3 \le 5$$
$$3x_1 - x_2 - x_3 \le 0$$
$$x_1, x_2, x_3, x_4 \ge 0$$

Soln → $\frac{14x_1}{3} + \frac{x_2}{3} - 2x_3 + x_4 = \frac{7}{3}$

$$16x_1 + x_2 - 6x_3 + x_5 = 5$$

$$3x_1 - x_2 - x_3 + x_6 = 0$$

$$x_i \ge 0$$
$$i = 1, \dots, 6$$

Initial simplex table :-

| | $c_j$ | | 107 | 1 | 2 | 0 | 0 | 0 | $x_B/y_i$ |
|---|---|---|---|---|---|---|---|---|---|
| B | $C_B$ | $x_B$ | $y_1$ | $y_2$ | $y_3$ | $y_4$ | $y_5$ | $y_6$ | min. ratio |
| $y_4$ | 0 | 7/3 | 14/3 | 1/3 | −2 | 1 | 0 | 0 | 1/2 |
| $y_5$ | 0 | 5 | 16 | 1 | −6 | 0 | 1 | 0 | 5/16 |
| $y_6$ | 0 | 0 | $\boxed{3}$ | −1 | −1 | 0 | 0 | 1 | 0 → |
| | | $Z = C_B x_B = 0$ | −107 ↑ | −1 | −2 | 0 | 0 | 0 | |

| | | $C_j \to$ | $-107$ | $-1$ | $-2$ | $0$ | $0$ | $0$ | |
|---|---|---|---|---|---|---|---|---|---|
| B | $C_B$ | $x_B$ | $y_1$ | $y_2$ | $y_3$ | $y_4$ | $y_5$ | $y_A$ | Min ratio |
| $y_4$ | 0 | $7/3$ | 0 | $17/9$ | $-4/9$ | 1 | 0 | $-14/9$ | |
| $y_5$ | 0 | 5 | 0 | $19/3$ | $-2/3$ | 0 | 1 | $-16/3$ | |
| $y_A$ | 107 | 0 | 1 | $-1/3$ | $-1/3$ | 0 | 0 | $1/3$ | |
| | | $z=0$ | 0 | $-110/3$ | $-119/3$ | 0 | 0 | $107/3$ | |

each entry of

Since, the column vector $y_3$ correspondig to net evaluation $z_3 - c_3$, each negative.
This indicate that there is an unbounded soln of the given LPP

Ques → Use Simplex Method to solve the LPP

$$\text{Max } Z = 3x_1 + 2x_2$$

s.t.

$$x_1 + x_2 \leq 4$$
$$x_1 - x_2 \leq 2$$
$$x_1, x_2 \geq 0$$

Soln → $\text{Max } Z = 3x_1 + 2x_2 + 0x_3 + 0x_4$

$$x_1 + x_2 + x_3 = 4$$
$$x_1 - x_2 + x_4 = 2$$

| | | | 3 | 2 | 0 | 0 | |
|---|---|---|---|---|---|---|---|
| B | $C_B$ | $X_B$ | $y_1$ | $y_2$ | $y_3$ | $y_4$ | Min ratio |
| $y_3$ | 0 | 4 | 1 | 1 | 1 | 0 | 4 |
| $y_4$ | 0 | 2 | $\boxed{1}$ | -1 | 0 | 1 | 2 → |

Z = 0   -3   -2   0   0

↑

| | | | 3 | 2 | 0 | 0 | |
|---|---|---|---|---|---|---|---|
| B | $C_B$ | $X_B$ | $y_1$ | $y_2$ | $y_3$ | $y_4$ | min ratio |
| $y_3$ | 0 | -2 | 0 | $\boxed{-2}$ | -1 | 1 | [illegible] 0 → |
| $y_1$ | 3 | 2 | $\boxed{1}$ | $\boxed{-1}$ | 0 | 1 | [illegible] = [illegible] -3/3 → |

Z = 6   0   -5   0   0   -3

↑   ↑

$x_1 = 3$, $x_2 = 0$

Max Z = 9

| | | | 3 | 2 | 0 | 0 | |
|---|---|---|---|---|---|---|---|
| B | $C_B$ | $X_B$ | $y_1$ | $y_2$ | $y_3$ | $y_4$ | Min ratio |
| $y_2$ | [illegible] | 1 | 0 | 1 | 1/2 | -1/2 | |
| $y_1$ | $\boxed{3}$ | 3 | 1 | 0 | 1/2 | 1/2 | |

Z = 12   0   0   3/2   1/2

$x_1 = 3$, $x_2 = 1$

$\text{Max } z = 3x_1 + 2x_2 = 3 \times 3 + 2 \times 1 = 9 + 2 = 11$