From this table x_1 is the entering variable & S_2 is the leaving variable & 1 is the pivotal element

First Iteration Method

Basis		cost c_j	3	2	0	0	Ratio
C_B	B	soln x_B	x_1	x_2	S_1	S_2	
0	S_1	2	0	2	1	-1	1
3	x_1	2	1	-1	0	1	-2
optimality is not obtained		$z_j = 6$	3	-3	0	3	
		$z_j - c_j$	0	-5	0	3	

From this table x_2 is the entering variable & S_1 is the leaving variable & 2 is the pivotal element

Second Iteration Method

Basis		cost c_j	3	2	0	0	Ratio
C_B	B	soln x_B	x_1	x_2	S_1	S_2	
2	x_2	1	0	1	$1/2$	$-1/2$	
3	x_1	3	1	0	$1/2$	$1/2$	
optimality is obtained		$z_j = 11$	3	2	$5/2$	$1/2$	
		$z_j - c_j$	0	0	$5/2$	$1/2$	

Hence $z_j - c_j \geq 0$

Hence the optimality is attained

Hence the optimal soln is $x_1 = 3$ $x_2 = 1$

The max value of the obj fn is $z = 11$.

Operation Research

Simplex Method

1. $\max z = 4x_1 + 10x_2$

subject to constraints is,

$$2x_1 + x_2 \leq 50$$
$$2x_1 + 5x_2 \leq 100$$
$$2x_1 + 3x_2 \leq 90$$
$$x_1, x_2 \geq 0$$

sol:

G.T. $\max z = 4x_1 + 10x_2$

Subject to constraint is,

$$2x_1 + x_2 \leq 50$$
$$2x_1 + 5x_2 \leq 100$$
$$2x_1 + 3x_2 \leq 90$$
$$x_1, x_2 \geq 0$$

The std form of LPP is,

$\max z = 4x_1 + 10x_2 + 0S_1 + 0S_2 + 0S_3$

Subject to constraint is,

$$2x_1 + x_2 + S_1 = 50$$
$$2x_1 + 5x_2 + S_2 = 100$$
$$2x_1 + 3x_2 + S_3 = 90$$
$$x_1, x_2, S_1, S_2, S_3 \geq 0$$

The initial basic feasible solution is got by putting $x_1 = 0$
$x_2 = 0$.

$S_1 = 50 \quad S_2 = 100 \quad S_3 = 90$.

2. Max $z = 3x_1 + 2x_2$

Subject to constraint is,

$x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

$x_1, x_2 \geq 0$

sol:-

G.T

Max $z = 3x_1 + 2x_2$

subject to constraint is,

$x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

$x_1, x_2 \geq 0$

The std form of LPP is,

Max $z = 3x_1 + 2x_2 + 0S_1 + 0S_2$

subject to constraint,

$x_1 + x_2 + S_1 = 4$

$x_1 - x_2 + S_2 = 0$

$x_1, x_2, S_1, S_2 \geq 0$

The initial basic feasible solution is got by putting,

$x_1 = 0$ $x_2 = 0$ $S_1 = 4$ $S_2 = 2$.

Initial simplex Table :-

Basis		cost c_j	3	2	0	0	Ratio
C_B	B	soln x_B	x_1	x_2	S_1	S_2	
0	S_1	4	1	1	1	0	4
0	S_2	2	$\boxed{1}$	-1	0	1	2 ←
optimality is not obtained		$z_j = 0$	0	0	0	0	
		$z_j - c_j$	-3 ↑	-2	0	0	

First Iteration Method

Basis		cost c_j	3	2	0	0	Ratio
CB	B	soln x_B	x_1	x_2	S_1	S_2	
0	S_1	3	0	$\boxed{1/2}$	1	$-1/2$	6 ←
3	x_1	3	1	$1/2$	0	$1/2$	6
optimality is not attained		$z_j = 9$	3	$3/2$	0	$3/2$	
		$z_j - c_j$	0	$-1/2$ ↑	0	$3/2$	

From this table x_2 is entering variable & S_1 is the leaving variable & $1/2$ is pivotal element

2nd Iteration Method :

Basis		cost c_j	3	2	0	0	Ratio
CB	B	soln x_B	x_1	x_2	S_1	S_2	
2	x_2	6	0	1	2	-1	
3	x_1	0	1	0	-1	1	
Optimality is attained		$z_j = 12$	3	2	3	1	
		$z_j - c_j$	0	0	3	1	

Hence $z_j - c_j \geq 0$

Hence the optimality is attained

Hence the optimal soln is $x_1 = 0$ $x_2 = 6$

The max value of the obj fn is $\text{Max } z = 12$.

Graphical Method

4. Max $z = 2x_1 + 4x_2$

s.c. $x_1 + 2x_2 \le 5$

$x_1 + x_2 \le 4$

where $x_1, x_2 \ge 0$

sol G.T. Max $z = 2x_1 + 4x_2$

Sc to. $x_1 + 2x_2 \le 5$

$x_1 + x_2 \le 4$

$x_1, x_2 \ge 0$.

the problem is std form taken x_1 & x_2 axis first constraint

Now consider $x_1 + 2x_2 = 5$

when $x_1 = 0$ $\quad$ $x_2 = 0$

$2x_2 = 5$ $\quad$ $x_1 = 5$

$x_2 = 2.5$

pt A $(0, 2.5)$ B $(5, 0)$

Now consider $x_1 + x_2 = 4$

when $x_1 = 0$ $\quad$ $x_2 = 0$

$x_2 = 4$ $\quad$ $x_1 = 4$

pt C $(0, 4)$ D $(4, 0)$

solving. $x_1 + 2x_2 = 5$ — ①

$x_1 + x_2 = 4$ — ②

$x_1 + 2x_2 = 5$

$x_1 + x_2 = 4$

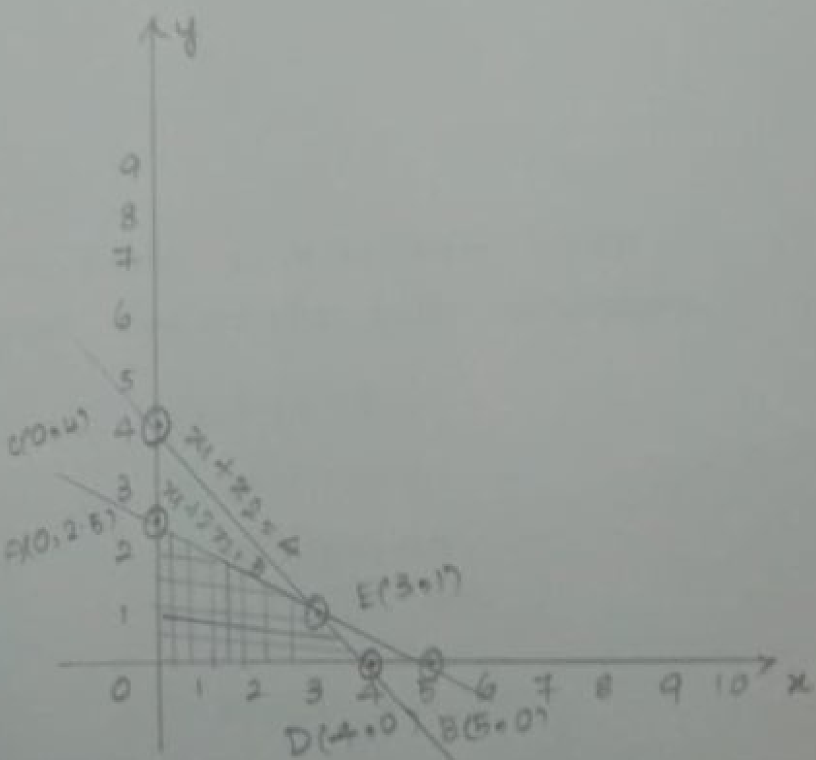
(-) (-) (-)

$x_2 = 1$

sub x_2 value in ② eqn,

$x_1 + 1 = 4$

$x_1 = 3$



3 Max $z = 3x_1 + 2x_2$

sc to,

$x_1 + x_2 \le 6$

$2x_1 + x_2 \le 6$

$x_1, x_2 \ge 0$

Sol

G.T Max $z = 3x_1 + 2x_2$

sc to.

$x_1 + x_2 \le 6$

$2x_1 + x_2 \le 6$

$x_1, x_2 \ge 0$

the std form of lpp is.

Max $z = 3x_1 + 2x_2 + 0s_1 + 0s_2$

sc to. $x_1 + x_2 + s_1 = 6$

$2x_1 + x_2 + s_2 = 6$

$x_1, x_2, s_1, s_2 \ge 0$

The initial basic feasible soln is got by putting $x_1 = 0$ $x_2 = 0$ $s_1 = 6$ $s_2 = 6$

Initial simplex Table :-

Basis		cost c_j	3	2	0	0	Ratio
C_B	B	soln x_B	x_1	x_2	s_1	s_2	
0	s_1	6	1	1	1	0	6
0	s_2	6	$\boxed{2}$	1	0	1	3 ←
optimality not attained		$z_j = 0$	0	0	0	0	
		$z_j - c_j$	-3 ↑	-2	0	0	

From this table x_1 is entering variable & s_2 is leaving variable & 2 is the pivotal element

The pt of intersection E is (3,1)

Hence the region of feasibility is the closed polygon of ODEA

the extreme pt of feasibility region is gn by O (0,0) A (0,2.5) D (4,0) E(3,1)

z at O (0,0) $= 2x_1 + 4x_2 = 2(0) + 4(0) = 0$

z at D (4,0) $= 2(4) + 4(0) = 8$

z at E (3,1) $= 2(3) + 4(1) = 10$

z at A (0,2.5) $= 2(0) + 4(2.5) = 10$

Now Max z is obtained at the pt E(3,1)

The optimal solu is $x_1 = 3$ $x_2 = 1$

The max value is 10.

5. Max $z = x_1 + x_2$

sc to, $x_1 + x_2 \leq 1$

$-3x_1 + x_2 \geq 3$

$x_1, x_2 \geq 0$

sol

GT Max $z = x_1 + x_2$

sc to, $x_1 + x_2 \leq 1$

$-3x_1 + x_2 \geq 3$

$x_1, x_2 \geq 0$

This problem is std form taken x_1 & x_2 axis since $x_1, x_2 \geq 0$ The feasibility region lies in the first constraint

Now consider $x_1 + x_2 = 1$

$x_1 = 0$ $x_2 = 0$

$x_2 = 1$ $x_1 = 1$

pt A (0,1) B(1,0)

$-3x_1 + x_2 = 3$

$x_1 = 0$ $x_2 = 0$

$x_2 = 3$ $-3x_1 = 3$

$x_1 = 3/-3$

$x_1 = -1$.

C(0,3) D(-1,0)

Initial Simplex Table :-

Basis		cost c_j	4	10	0	0	0	Ratio
C_B	B	soln x_B	x_1	x_2	s_1	s_2	s_3	
0	s_1	50	2	1	1	0	0	50
0	s_2	100	2	$\boxed{5}$	0	1	0	20 ←
0	s_3	90	2	3	0	0	1	30
optimality is not obtained	$z_j = 0$	0	0	0	0	0	
	$z_j - c_j$	-4	-10 ↑	0	0	0	

From this table x_2 is entering variable, s_2 is the leaving variable & 5 is the pivotal element.

First Iteration Table

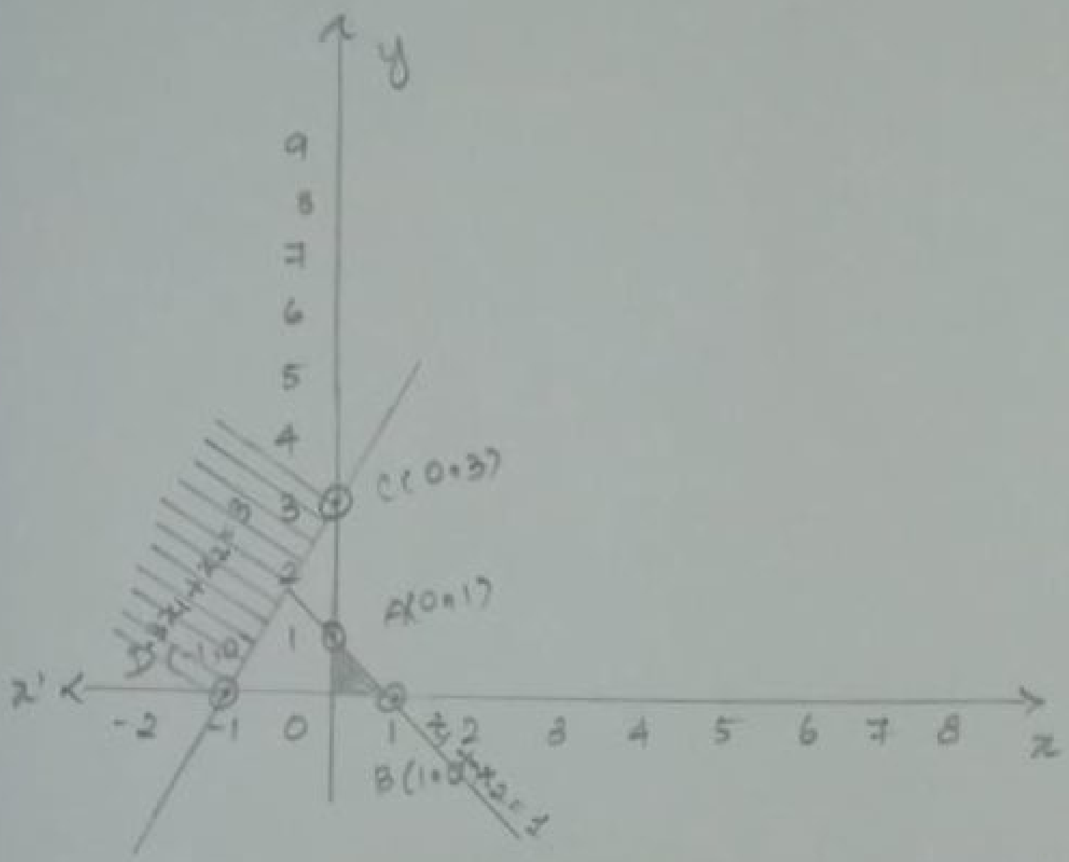
Basis		cost c_j	4	10	0	0	0	Ratio
C_B	B	soln x_B	x_1	x_2	s_1	s_2	s_3	
0	s_1	30	8/5	0	1	-1/5	0	
10	x_2	20	2/5	1	0	1/5	0	
0	s_3	30	4/5	0	0	-3/5	1	
optimality not obtained	$z_j = 200$	4	10	0	2	0	
	$z_j - c_j$	0	0	0	2	0	

Hence $z_j - c_j \geq 0$

Hence the optimality is attained

Hence the optimal solu is $x_1 = 0$ $x_2 = 20$

The max value of the obj fn is 200.



The half plane determined by the constraints $x_1 + x_2 \leq 1$ & the half plane determined by the constraint $-3x_1 + x_2 \geq 3$

∴ Hence the feasible region is empty

Hence the LPP has infeasible solution.