

MP-1 TUTORIAL-2

1. Demonstrate the Simplex method in Linear Programming and its special cases and applications.

QUESTION:

Maximize: $P=40x_1+35x_2$

Subject To: $x_1 + x_2 \leq 24$

$3x_1 + 2x_2 \leq 60$

$x_1, x_2 \geq 0$

$$\text{Maximize : } P = 40x_1 + 35x_2$$

$$\text{Subject To : } x_1 + x_2 \leq 24$$

$$3x_1 + 2x_2 \leq 60$$

$$x_1, x_2 \geq 0$$

Adding slack variables

$$x_1 + x_2 + s_1 = 24$$

$$3x_1 + 2x_2 + s_2 = 60$$

$$\text{Objective function } P = 40x_1 + 35x_2 + 0s_1 + 0s_2$$

Initial table

CB_i	C_j	40	35	0	0	
	Basic variable	x_1	x_2	s_1	s_2	Sol
0	s_1	1	1	1	0	24
0	s_2	3	2	0	1	60
	Z_j	0	0	0	0	
	$C_j - Z_j$	40	35	0	0	

Ratio min
24
20

Iteration - 1

CB_i	C_j	40	35	0	0	
	Basic variable	x_1	x_2	s_1	s_2	Sol
0	s_1	0	1/3	1	-1/3	4
40	x_1	1	2/3	0	1/3	20
	Z_j	40	80/3	0	40/3	
	$C_j - Z_j$	0	25/3	0	-40/3	

12
30

Iteration - 2

C_B	C_j	40	35	0	0	
	Basic variables	x_1	x_2	s_1	s_2	sol
35	x_2	0	1	3	-1	12
40	x_1	1	0	-2	1	12
	Z_j	40	35	25	5	
	$C_j - Z_j$	0	0	-25	-5	

$$\therefore x_1 = 12 \quad x_2 = 12$$

$$P = 40(12) + 35(12)$$

$$= 480 + 420$$

$$P = 900$$

Special cases:-

- ① Degeneracy
- ② Alternative optima
- ③ unbounded solutions
- ④ Non existing (or) infeasible solutions

Application:-

The simplex method is the most popular and successful method for solving linear programs.

The objective function of linear programming problem involves in the maximization and minimization problem with the set of linear equalities and inequalities constraints.