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MP-1 TUTORIAL-3

1. **Demonstrate Two Phase Simplex method in Linear Programming. Bounded variable problem.**

QUESTION:

Minimum Z=x1+x2

Subject to:

2x1 + x2 >=4

X1 + 7x2 >=7

And x1, x2>=0

Converting minimization to maximization

maximize $z = -x_1 + (-x_2)$

Subject to : $2x_1 + x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

$x_1, x_2 \geq 0$

converting inequalities to equalities

$2x_1 + x_2 - s_1 + A_1 = 4$

$x_1 + 7x_2 - s_2 + A_2 = 7$

phase - I

Maximize $0x_1 + 0x_2 + 0s_1 + 0s_2 - A_1 - A_2$

Subject to

$2x_1 + x_2 - s_1 + A_1 = 4$

$x_1 + 7x_2 - s_2 + A_2 = 7$

Initial Table

C_{Bi}	C_j	0	0	0	0	-1	-1	
	B.V	x_1	x_2	s_1	s_2	A_1	A_2	Sol
-1	A_1	2	1	-1	0	1	0	4
-1	A_2	1	7	0	-1	0	1	7
	Z_j	-3	-8	1	1	-1	-1	
	$C_j - Z_j$	3	8	-1	-1	0	0	

2. Entering variable = x_2
leaving variable = A_2
key element = 7

Iteration - 1

C_{Bi}	C_j	0	0	0	0	-1	-1	
	B.V	x_1	x_2	S_1	S_2	A_1	A_2	sol
-1	A_1	$13/7$	0	-1	$1/7$	1	$-1/7$	3
0	x_2	$1/7$	1	0	$-1/7$	0	$1/7$	1
	Z_j	$-13/7$	0	1	$-1/7$	-1	$1/7$	
	$C_j - Z_j$	$13/7$	0	-1	$1/7$	0	$-8/7$	

Entering variable : x_1
leaving variable : A_1
keyelement : $13/7$

Iteration - II

C_{Bi}	C_j	0	0	0	0	-1	-1	
	B.V	x_1	x_2	S_1	S_2	A_1	A_2	sol
0	x_1	1	0	$-7/13$	$1/13$	$7/13$	$-1/13$	$21/13$
0	x_2	0	1	$1/13$	$\frac{-14}{91}$	$-1/13$	$-12/91$	$10/13$
	Z_j	0	0	0	0	0	0	0
	$C_j - Z_j$	0	0	0	0	-1	-1	

phase-1 terminates because both the artificial variables have been removed from the basis

phase-2 :

C_B	c_j	-1	-1	0	0	
	BV	x_1	x_2	S_1	S_2	sol
-1	x_1	1	0	-7/13	1/13	21/13
-1	x_2	0	1	1/13	-14/91	10/13
	z_j	-1	-1	6/13	1/13	-31/13
	$c_j - z_j$	0	0	-6/13	-1/13	

$x_1 = 21/13$

$x_2 = 10/3$

(maximization) $Z = -31/13$

Since the problem is of minimization

$$\text{minimize} \sum_{j=1}^{n} c_j x_j = \text{maximize} \sum_{j=1}^{n} (-c_j) x_j$$

Hence $z(\text{minimize}) = 31/13$

$x_1 = 21/13$

$x_2 = 10/13$