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SP19-BSE-0019

BM

Assignment # 04

OR

# QNO # 1

$$x_1 + x_2 + x_3 = 7$$

$$2x_1 - 2x_2 + x_3 \geq 10$$

$$x_1, x_2, x_3 \geq 0$$

(a)

$$\text{Max } Z = 2x_1 + 3x_2 - 5x_3$$

USING BIG M METHOD

Standard form:

$$x_1 + x_2 + x_3 + a_1 = 7$$

$$2x_1 - 2x_2 + x_3 - b_1 + a_2 = 10$$

$$x_1, x_2, x_3 \geq 0$$

$$a_1, a_2 \geq 0$$

$$b_1 \geq 0$$

$$\text{Max } Z = 2x_1 + 3x_2 - 5x_3 - Ma_1 - Ma_2$$

BV	$x_1$	$x_2$	$x_3$	$b_1$	$a_1$	$a_2$	RHS
Z	-2	-3	5	0	100	100	0
$a_1$	1	1	1	0	1	0	7
$a_2$	2	-2	1	-1	0	1	10

BV	$x_1$	$x_2$	$x_3$	<del><math>b_1</math></del>	$a_1$	$a_2$	RHS	MR
Z	-302	97	-195	100	0	0	-1700	
$a_1$	1	1	1	0	1	0	7	7
← $a_2$	2	-2	1	-1	0	1	10	5

$x_1$  is Entering  
 $a_2$  is leaving

↓

BV	$x_1$	$x_2$	$x_3$	$s_1$	$a_1$	$a_2$	RHS	MR
Z	0	-205	-44	-51	0	151	-190	
← $a_1$	0	2	$\frac{1}{2}$	$\frac{1}{2}$	1	$-\frac{1}{2}$	2	1
$x_1$	1	-1	$\frac{1}{2}$	$-\frac{1}{2}$	0	$\frac{1}{2}$	5	—

$x_2$  is Entering  
 $a_1$  is leaving

BV	$x_1$	$x_2$	$x_3$	$s_1$	$a_1$	$a_2$	RHS
Z	0	0	$\frac{29}{4}$	$\frac{1}{4}$	$\frac{205}{2}$	$\frac{399}{4}$	15
$x_2$	0	1	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{2}$	$-\frac{1}{4}$	1
$x_1$	1	0	$\frac{3}{4}$	$-\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$	6

$$Z = 15$$

~~$$6, 1, 0, \frac{1}{4}, \frac{205}{2}$$~~

$$(6, 1, 0, \frac{1}{4}, \frac{205}{2}, \frac{399}{4})$$

Verification:

$$Z = 2x_1 + 3x_2 - 5x_3$$

$$15 = 2(6) + 3(1) - 5(0)$$

$$15 = 15$$

verified



(6)

$$\text{Min } Z = 2x_1 + 3x_2 - 5x_3 \quad (\text{Two-Phase Method})$$

Standard form:

$$x_1 + x_2 + x_3 + a_1 = 7$$

$$2x_1 - 2x_2 + x_3 - s_1 + a_2 = 10$$

$$x_1, x_2, x_3 \geq 0$$

$$a_1, a_2 \geq 0$$

$$s_1 \geq 0$$

Phase #01

$$\text{Min } Z = a_1 + a_2$$

BV	$x_1$	$x_2$	$x_3$	$s_1$	$a_1$	$a_2$	RHS
Z	0	0	0	0	-1	-1	0
$a_1$	1	1	1	0	1	0	7
$a_2$	2	-2	1	-1	0	1	10

↓								
BV	$x_1$	$x_2$	$x_3$	$s_1$	$a_1$	$a_2$	RHS	MR
Z	3	-1	2	-1	0	0	17	
$a_1$	1	1	1	0	1	0	7	7
← $a_2$	2	-2	1	-1	0	1	10	5

$x_1$  is Entering  
 $a_2$  is leaving

BV	$x_1$	$x_2$	$x_3$	$s_1$	$a_1$	$a_2$	RHS	MR
Z	0	2	$\frac{1}{2}$	$\frac{1}{2}$	0	$-\frac{3}{2}$	2	
$\leftarrow a_1$	0	2	$\frac{1}{2}$	$\frac{1}{2}$	1	$-\frac{1}{2}$	2	1
$x_1$	1	-1	$\frac{1}{2}$	$-\frac{1}{2}$	0	$\frac{1}{2}$	5	-

$x_2$  is Entering  
 $a_1$  is leaving

BV	$x_1$	$x_2$	$x_3$	$s_1$	$a_1$	$a_2$	RHS	MR
Z	0	0	0	0	-1	-1	0	
$x_2$	0	1	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{2}$	$-\frac{1}{4}$	1	
$x_1$	1	0	$\frac{3}{4}$	$-\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$	6	

Phase #02

BV	$x_1$	$x_2$	$x_3$	$s_1$	RHS	MR
Z	-2	-3	5	0	0	
$x_2$	0	1	$\frac{1}{4}$	$\frac{1}{4}$	1	*
$x_1$	1	0	$\frac{3}{4}$	$-\frac{1}{4}$	6	-

BV	$x_1$	$x_2$	$x_3$	$s_1$	RHS
Z	0	-3	$\frac{13}{2}$	$-\frac{1}{2}$	12
$x_2$	0	1	$\frac{1}{4}$	$\frac{1}{4}$	1
$x_1$	1	0	$\frac{3}{4}$	$-\frac{1}{4}$	6



BV	$x_1$	$x_2$	$x_3$	$s_1$	RHS
Z	0	0	$29/4$	$1/4$	15
$x_2$	0	1	$1/4$	$1/4$	1
$x_1$	1	0	$3/4$	$-1/4$	6

$$Z = 15$$

$$(6, 1, 0, 1/4)$$

verification:

$$Z = 2(x_1) + 3x_2 - 5x_3$$

$$15 = 2(6) + 3(1) - 5(0)$$

$$15 = 15$$

verified

## QNO# 2

$$\text{Max } Z = 2x_1 + 2x_2 + 4x_3$$

$$2x_1 + x_2 + x_3 \leq 2$$

$$3x_1 + 4x_2 + 2x_3 \geq 10$$

$$x_1, x_2, x_3 \geq 0$$

By using Big M Method.

Standard form:

$$2x_1 + x_2 + x_3 + S_1 = 2$$

$$3x_1 + 4x_2 + 2x_3 - S_2 + a_1 = 10$$

$$x_1, x_2, x_3 \geq 0$$

$$S_1, S_2 \geq 0$$

$$a_1 \geq 0$$

$$\text{Max } Z = 2x_1 + 2x_2 + 4x_3 - Ma_1$$

BV	$x_1$	$x_2$	$x_3$	$S_1$	$S_2$	$a_1$	RHS
Z	-2	-2	-4	0	0	100	0
$S_1$	2	1	1	1	0	0	2
$a_1$	3	4	2	0	-1	1	10

BV	$x_1$	$x_2$	$x_3$	$S_1$	$S_2$	$a_1$	RHS	MR
Z	-302	-402	-204	0	100	0	-1000	
← $S_1$	2	1	1	1	0	0	2	2
$a_1$	3	4	2	0	-1	1	10	5/2

$x_2$  is Entering  
 $S_1$  is leaving



BV	$x_1$	$x_2$	$x_3$	$s_1$	$s_2$	$a_1$	RHS	MR
Z	502	0	198	402	100	0	-196	
$x_2$ <del><math>x_1</math></del>	2	1	1	1	0	0	2	
$a_1$	-5	0	-2	-4	-1	1	2	

Infeasible Solution, Solution is not possible.