

Q.3

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① Max. $7x_1 + 6x_2$
S.t.

$$x_1 + x_2 + x_3 = 4$$

$$2x_1 + x_2 + x_4 = 6$$

$$x_1, x_2, x_3, x_4 \geq 0$$

Ans:

		7	6	0	0		
		x_1	x_2	x_3	x_4	RHS	Q
0	x_3	1	1	1	0	4	4
0	x_4	2	1	0	1	6	3 →
$C_j - Z_j$		7	6	0	0		

		7	6	0	0		
		x_1	x_2	x_3	x_4	RHS	Q
0	x_3	0	$\frac{1}{2}$	1	$-\frac{1}{2}$	2	2 →
7	x_1	1	$\frac{1}{2}$	0	$\frac{1}{2}$	3	6
Z_j		7	$\frac{7}{2}$	0	$\frac{7}{2}$	21	
$C_j - Z_j$		0	$\frac{5}{2}$	0	$-\frac{7}{2}$		

		7	6	0	0	
		x_1	x_2	x_3	x_4	
6	x_2	0	1	2	-1	2
7	x_1	1	0	-1	1	2
Z_j		7	6	5	1	
$C_j - Z_j$		0	0	-5	-1	

$$x_1 = 2$$

$$x_2 = 2$$

$$Z = 7 \cdot 2 + 6 \cdot 2$$

$$= 14 + 12$$

$$= 26$$

$$\text{Min } 4a + 6b + Me + Mf \Rightarrow \text{Max } -4a - 6b - Me - Mf$$

$$a + 2b - c + e = 7$$

$$a + b - d + f = 6 \quad a, b, c, d, e, f \geq 0$$

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(2)

		-4	-6	0	0	-M	-M		
		a	b	c	d	e	f	RHS	Q
(-M)	e	1	2	-1	0	1	0	7	7/2
(-M)	f	1	1	0	-1	0	1	6	6
	Z_j	-2M	-3M	M	M	-M	-M		
	$C_j - Z_j$	2M-4	3M-6	-M	-M	0	0		

		-4	-6	0	0	-M	-M		
		a	b	c	d	e	f	RHS	Q
(-6)	b	1/2	1	-1/2	0	1/2	0	7/2	7
(-M)	f	1/2	0	1/2	-1	-1/2	1	5/2	5 →
	Z_j	-6M/2	-6	6M/2	M	-6M/2	-M		
	$C_j - Z_j$	M-2/2	0	M-6/2	-M	3M-6/2	-M		

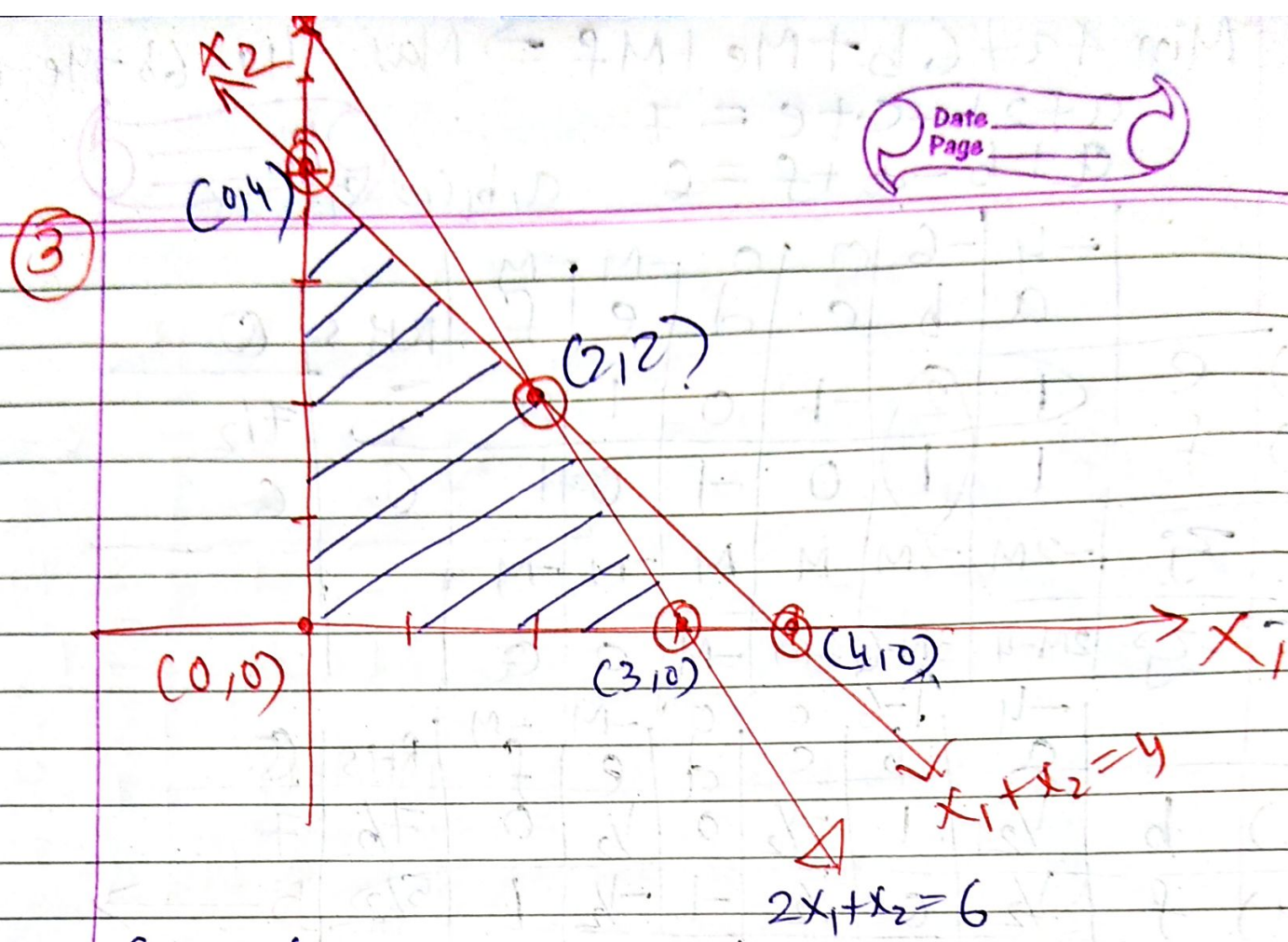
		-4	-6	0	0	-M	-M		
		a	b	c	d	e	f	RHS	Q
(-6)	b	0	1	-1	1	1	-1	1	
(-4)	a	1	0	1	-2	-1	2	5	
	Z_j	-4	-6	2	2	-2	-2	-26	
	$C_j - Z_j$	0	0	-2	-2	M+2	M+2		

stop

$$b = 1$$

$$a = 5$$

$$\therefore Z = -(-26) = 26$$



Corner s

$$Z = 7x_1 + 6x_2$$

(0,0)	0
(0,4)	24
(3,0)	21
(2,2)	26

→ Optimal

Q.3 O R

X_1 hectares for crop X
 X_2 hectares for crop Y

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(1) Max. $10500X_1 + 9000X_2$

s.t. $X_1 + X_2 \leq 50$

$20X_1 + 10X_2 \leq 800 \Rightarrow 2X_1 + X_2 \leq 80$

(2) $X_1, X_2 \geq 0$

	X_1	X_2	X_3	X_4	RHS	θ
$0 \rightarrow X_3$	1	1	1	0	50	50
$0 \rightarrow X_4$	2	1	0	1	80	40
Z_j	0	0	0	0	0	
$C_j - Z_j$	10500	9000	0	0		

	X_1	X_2	X_3	X_4	RHS	θ
$0 \rightarrow X_3$	0	$\frac{1}{2}$	1	$-\frac{1}{2}$	10	20
10500 X_1	1	$\frac{1}{2}$	0	$\frac{1}{2}$	40	80
Z_j	10500	5250	0	5250	42000	
$C_j - Z_j$	0	3750	0	-5250		

	X_1	X_2	X_3	X_4	RHS	θ
9000 X_2	0	1	2	-1	20	
10500 X_1	1	0	-1	1	30	
Z_j	10500	9000	7500	1500		
$C_j - Z_j$	0	0	-7500	-1500		

$X_2 = 20$ h
 $X_1 = 30$ h

$Z = 9000 \times 20 + 10500 \times 30$
 $= 180000 + 315000 = 495000$

③ Min. $50a + 80b + Me + Mf \Rightarrow \text{Max } -50a - 80b - Me - Mf$
 s.t. $a + 2b - c + e = 10500$
 $a + b - d + f = 9000$
 $a, b, c, d, e, f \geq 0$

	-50	-80	0	0	$-M$	$-M$		
	a	b	c	d	e	f	RHS	Q
$-Me$	1	2	-1	0	1	0	10500	5250
$-Mf$	1	1	0	-1	0	1	9000	9000
Z_j	$-2M$	$-3M$	M	M	$-M$	$-M$		
$C_j - Z_j$	$2M - 50$	$3M - 80$	$-M$	$-M$	0	0		

	-50	-80	0	0	$-M$	$-M$		
	a	b	c	d	e	f	RHS	Q
$(-80)b$	$\frac{1}{2}$	1	$-\frac{1}{2}$	0	$\frac{1}{2}$	0	5250	10500
$(-M)f$	$\frac{1}{2}$	0	$\frac{1}{2}$	-1	$-\frac{1}{2}$	1	3750	7500
Z_j	$-\frac{80-M}{2}$	-80	$\frac{80-M}{2}$	M	$-\frac{80+M}{2}$	$-M$		
$C_j - Z_j$	$\frac{M-20}{2}$	0	$\frac{M-80}{2}$	$-M$	$\frac{80-3M}{2}$	0		

	-50	-80	0	0	$-M$	$-M$		
	a	b	c	d	e	f	RHS	Q
$(-80)b$	0	1	-1	1	1	-1	1500	
$(-50)a$	1	0	1	-2	-1	2	7500	
Z_j	-50	-80	30	20	-30	-20		
$C_j - Z_j$	0	0	-30	-20	$-M+30$	$-M+20$		

$(-80) \times 1500 + (-50) \times 7500 = -49500$
 $Z = 49500$

Solⁿ:

$b = 1500$

$a = 7500$

$Z = 49500$