Simplex Method

Grap (A)

Q1

$$\text{Min}(Z) = -5X_1 - 3X_2 + 2X_3$$
$$X_1 + X_2 + X_3 + S_1 = 5$$
$$X_1 - 2X_2 - 2X_3 + S_2 = 4$$
$$3X_1 + 3X_2 + 2X_3 + S_3 = 15$$

	X_1	X_2	X_3	S_1	S_2	S_3	R.H.S	Ratio
	5	3	-2	0	0	0	0	
S_1	1	1	1	1	0	0	5	
S_2	1	-2	-2	0	1	0	4	
S_3	3	3	2	0	0	1	15	

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	X_1	X_2	X_3	S_1	S_2	S_3	R.H.S	
	0	13	8	0	-5	0	-20	
S_1	0	3	3	1	-1	0	1	÷ 3
X_1	1	-2	-2	0	1	0	4	
S_3	0	9	8	0	-3	1	3	

$*-5$ (Z)

$$\begin{array}{ccccccc} 1 & -2 & -2 & 0 & 1 & 0 & 4 \\ 5 & 3 & -2 & 0 & 0 & 0 & 0 \\ \hline \boxed{0} & 13 & 8 & 0 & -5 & 0 & -20 \end{array}$$

$*-1$ (S_1)

$$\begin{array}{ccccccc} 1 & -2 & -2 & 0 & 1 & 0 & 4 \\ 1 & 1 & 1 & 1 & 0 & 0 & 5 \\ \hline \boxed{0} & 3 & 3 & 1 & -1 & 0 & 1 \end{array}$$

(S_3)

$*3$

$$\begin{array}{ccccccc} 1 & -2 & -2 & 0 & 1 & 0 & 4 \\ 3 & 3 & 2 & 0 & 0 & 1 & 15 \\ \hline \boxed{0} & 9 & 8 & 0 & -3 & 1 & 3 \end{array}$$

	X_1	X_2	X_3	S_1	S_2	S_3	R.H.S
	0	0	-5	$-13/3$	$-2/3$	0	$-73/3$
X_2	0	1	1	$1/3$	$-1/3$	0	$1/3$
X_1	1	0	0	$2/3$	$1/3$	0	$14/3$
S_3	0	0	-1	-3	0	1	0

$*-13$ (Z)

$$\begin{array}{ccccccc} 0 & 1 & 1 & \frac{1}{3} & -\frac{1}{3} & 0 & \frac{1}{3} \\ 0 & 13 & 8 & 0 & -5 & 0 & -20 \\ \hline 0 & \boxed{0} & -5 & \frac{-13}{3} & \frac{-2}{3} & 0 & \frac{-73}{3} \end{array}$$

$*2$ (X_1)

$$\begin{array}{ccccccc} 0 & 1 & 1 & \frac{1}{3} & -\frac{1}{3} & 0 & \frac{1}{3} \\ 1 & -2 & -2 & 0 & 1 & 0 & 4 \\ \hline 1 & \boxed{0} & 0 & 2/3 & 1/3 & 0 & 14/3 \end{array}$$

$*-9$ (S_3)

$$\begin{array}{ccccccc} 0 & 1 & 1 & \frac{1}{3} & -\frac{1}{3} & 0 & \frac{1}{3} \\ 0 & 9 & 8 & 0 & -3 & 1 & 3 \\ \hline 0 & \boxed{0} & -1 & -3 & 0 & 1 & 0 \end{array}$$

Conical Form

Q2

$$\text{Max } Z = X_1 + 2X_2 - X_4$$

$$\left.\begin{array}{l} X_1 + X_2 + X_3 + X_4 \leq 10 \\ -X_1 - X_2 - X_3 - X_4 \leq -10 \end{array}\right\} \text{——— (1)}$$

$$-X_2 \quad - X_4 \leq -4 \text{ ——— (2)}$$

$$\left.\begin{array}{l} X_2 + X_3 + X_4 \leq 5 \\ -X_2 - X_3 - X_4 \leq 5 \end{array}\right\} \text{——— (3)}$$

$$X_1, X_2, X_3, X_4 \geq 0$$

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Q1 $Max(Z) = 5X_1 + 3X_2 + 0S_1 + 0S_2 + 0S_3$

Group (B)

Simplex Method

$$X_1 + X_2 + S_1 = 30$$
$$2X_1 + X_2 + S_2 = 40$$
$$X_1 + S_3 = 45$$

	X_1	X_2	S_1	S_2	S_3	R.H.s	Ratio
	-5	-3	0	0	0	0	
S_1	1	1	1	0	0	30	30
S_2	2	1	0	1	0	40	20
S_3	1	0	0	0	1	45	45

$\div 2$

$$*5\ (1 \quad \tfrac{1}{2} \quad 0 \quad \tfrac{1}{2} \quad 0 \quad 20)\ (Z_1)$$
$$-5 \quad -3 \quad 0 \quad 0 \quad 0 \quad 0$$
$$\boxed{0} \quad -\tfrac{1}{2} \quad 0 \quad \tfrac{5}{2} \quad 0 \quad 100$$

$$*-1\ (1 \quad \tfrac{1}{2} \quad 0 \quad \tfrac{1}{2} \quad 0 \quad 20)$$
$$(S_1) \rightarrow 1 \quad 1 \quad 1 \quad 0 \quad 0 \quad 30$$
$$\boxed{0} \quad \tfrac{1}{2} \quad 1 \quad -\tfrac{1}{2} \quad 0 \quad 10$$

$$*-1\ (1 \quad \tfrac{1}{2} \quad 0 \quad \tfrac{1}{2} \quad 0 \quad 20$$
$$(S_3) \rightarrow 1 \quad 0 \quad 0 \quad 0 \quad 1 \quad 45$$
$$\boxed{0} \quad -\tfrac{1}{2} \quad 0 \quad -\tfrac{1}{2} \quad 1 \quad 25$$

	X_1	X_2	S_1	S_2	S_3	R.H.s	Ratio
	0	-1/2	0	5/2	0	100	
S_1	0	1/2	1	-1/2	0	10	20
X_1	1	$\frac{1}{2}$	0	1/2	0	20	40
S_3	0	-1/2	0	-1/2	1	25	تهمل

$$*\tfrac{1}{2}\ (0 \quad 1 \quad 2 \quad -1 \quad 0 \quad 20)$$
$$(Z) \quad 0 \quad -\tfrac{1}{2} \quad 0 \quad \tfrac{5}{2} \quad 0 \quad 100$$
$$0 \quad \boxed{0} \quad 1 \quad 2 \quad 0 \quad 110$$

$$*\tfrac{1}{2}\ (0 \quad 1 \quad 2 \quad -1 \quad 0 \quad 20)$$
$$(S_3) \quad 0 \quad -\tfrac{1}{2} \quad 0 \quad -\tfrac{1}{2} \quad 1 \quad 25$$
$$0 \quad \boxed{0} \quad 1 \quad -1 \quad 1 \quad 35$$

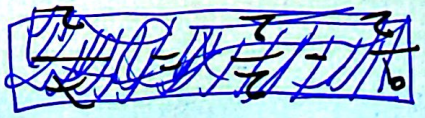
$$*\tfrac{1}{2}\ (0 \quad 1 \quad 2 \quad -1 \quad 0 \quad 20)$$
$$1 \quad \tfrac{1}{2} \quad 0 \quad \tfrac{1}{2} \quad 0 \quad 20$$
$$1 \quad \boxed{0} \quad -1 \quad 1 \quad 0 \quad 10$$

	X_1	X_2	S_1	S_2	S_3	R.H.s
	0	0	1	2	0	110
X_2	0	1	2	-1	0	20
X_1	1	0	-1	1	0	10
S_3	0	0	1	-1	1	35

Q2 Standard Form.

$$Max(Z) = X_1 + 2X_2 - X_4 + 0S_1 + 0S_2 + 0S_3$$
$$X_1 + X_2 + X_3 + X_4 - S_1 = 10$$
$$X_2 + X_4 - S_2 = 4$$
$$X_2 + X_3 - X_4 + S_3 = 5$$

$$X_1, X_2, X_3, X_4, S_1, S_2, S_3 \geq 0$$



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