Wolfee method 2200030300

1) $z = 2x_1 + x_2 - x_1^2$

Constraints:- $2x_1 + 3x_2 \le 6$

$2x_1 + x_2 \le 4$. $x_1, x_2 \ge 0$

Sol:- Consider non -ve conditions $x_1, x_2 \ge 0$.

as inequality constraints and add slack variables. and express them as equations.

$\max(z) = 2x_1 + x_2 - x_1^2$

Subject $2x_1 + 3x_2 + s_1^2 = 6$

$2x_2 + x_2 + s_2^2 = 4$

$-x_1 + r_1^2 = 0$

$-x_2 + r_2^2 = 0$.

we form Lagrange function.

$L(x, s, \lambda, r, \mu) = (2x_1 + x_2 - x_1^2) - \lambda_1(2x_1 + 3x_2 + s_1^2 - 6)$

$-\lambda_2(2x_1 + x_2 + s_2^2 - 4) - \mu_1(-x_1 + r_1^2)$

$- \mu_2(-x_2 + r_2^2)$

The necessary conditions are.

$$\frac{\partial L}{\partial x_1} = 2 - 2x_1 - 2\lambda - 2\lambda_2 + \mu_1 = 0$$

$$\frac{\partial L}{\partial x_2} = 1 - 3\lambda_1 - \lambda_2 + \mu = 0.$$

$$\frac{\partial L}{\partial s_1} = -2\lambda_1 s_1 = 0, \quad \frac{\partial L}{\partial s_2} = -2\lambda_2 s_2 = 0$$

$$\frac{\partial L}{\partial r_1} = -2\mu_1 r_1 = 0, \quad \frac{\partial L}{\partial r_2} = -2\mu_2 r_2 = 0$$

$$\frac{\partial L}{\partial \lambda} = 2x_1 + 2\lambda_1 + 2\lambda_2 - \mu_1 = 2$$

$$3\lambda_1 + \lambda_2 - \mu_2 = 1$$

$$2x_1 + 3x_2 + s_1^2 = 6$$

$$2x_1 + x_2 + s_2^2 = 4.$$

$$\lambda_1 s_1 = \lambda_2 s_2 = 0$$

$$\mu_1 r_1 = \mu_2 r_2 = 0$$

$$x_1, x_2, s_1, s_2, \lambda_1, \lambda_2 \geq 0$$

$$\min z^* = A_1 + A_2$$

$$2x_1 + 2\lambda_1 + 2\lambda_2 - \mu_1 + A_1 = 2$$

$$3\lambda_1 + \lambda_2 - \mu_2 + A_2 = 1$$

$$2x_1 + 3x_2 + s_1^2 = 6.$$

$$2x_1 + x_2 + s_2^2 = 4$$

C_B	BV	x_B	x_1	x_2	λ_1	λ_2	μ_1	μ_2	S_1	S_2	A_1	A_2
			0	0	0	0	0	0	0	0	1	1
1	A_1	$\boxed{2}$	$\boxed{2}$	0	2	2	-1	0	0	0	1	0
1	A_2	1	0	0	3	1	0	-1	0	0	0	1
0	S_1	6	2	3	0	0	0	0	1	0	0	0
0	S_2	4	2	1	0	0	0	0	0	1	0	0
	$Z_j - C_j$		2	0	5	3	-1	-1	0	0	0	0

C_B	BV	x_B	x_1	x_2	λ_1	λ_2	μ_1	μ_2	S_1	S_2	A_2	
0	x_1	1	1	0	1	1	-1/2	0	0	0	0	
1	A_2	1	0	0	3	1	0	-1	0	0	1	
0	S_1	4	0	$\boxed{3}$	-2	-2	1	0	1	0	0	4/3
0	S_2	2	0	1	-2	-2	1	0	0	1	0	2
	$Z_j - C_j$		0	0	3	1	0	-1	0	0	0	

C_B	BV	X_B	x_1	x_2	λ_1	λ_2	μ_1	μ_2	S_1	S_2	A_2	
0	x_1	1	1	0	1	1	1/2	0	0	0	0 1	
1	A_2	1	0	0	$\boxed{3}$	1	0	-1	0	0	1	1/3
0	x_2	4/3	0	1	-2/3	-2/3	1/3	0	1/3	0	0	
0	S_2	2/3	0	0	-4/3	-4/3	2/3	0	-1/3	1	0	
		$Z_j - C_j$	0	0	3	1	0	-1	0	0	-1	

C_B	B	X_B	x_1	x_2	λ_1	λ_2	μ_1	μ_2	S_1	S_2
0	x_1	2/3	1	0	0	2/3	-1/2	1/3	0	0
0	λ_1	1/3	0	0	1	1/3	0	-1/3	0	0
0	x_2	14/9	0	1	0	-4/9	1/3	-2/9	1/3	0
0	S_2	10/9	0	0	0	-8/9	2/3	-4/9	-1/3	1
		$Z_j - C_j$	0	0	0	0	0	0	0	0

here the values of x_1 & x_2 are.

$x_1 = 2/3 \quad x_2 = 14/9.$

$S_2 = 10/9 \quad \lambda_1 = 1/3 \quad \lambda_2 = 0 \quad \mu_1 = 0 \quad \mu_2 = 0$

$$\max z = 2\left(\frac{2}{3}\right) + (14/9) - \left(\frac{2}{3}\right)^2 = \frac{22}{9}.$$

optimum value:-

$$z = \frac{22}{9}$$