$$Z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$$

s.t. $x_1 + x_2 + x_3 = 20$

$x_1, x_2, x_3 \geq 0$

$$\Rightarrow L(x, \lambda) = (2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100) + \lambda(x_1 + x_2 + x_3 - 20)$$

$$\frac{\partial L}{\partial x_1} = 0 \Rightarrow 4x_1 + 10 + \lambda = 0 \quad \text{— (i)}$$

$$\Rightarrow x_1 = \frac{-10-\lambda}{4}$$

$$\frac{\partial L}{\partial x_2} = 0 \Rightarrow 2x_2 + 8 + \lambda = 0 \quad \text{— (ii)}$$

$$\Rightarrow x_2 = \frac{-8-\lambda}{2}$$

$$\frac{\partial L}{\partial x_3} = 0 \Rightarrow (3 \times 2)x_3 + 6 + \lambda = 0 \quad \text{— (iii)}$$

$$\Rightarrow x_3 = \frac{-6-\lambda}{6}$$

$$\frac{\partial L}{\partial \lambda} = 0 \Rightarrow x_1 + x_2 + x_3 - 20 = 0 \quad \text{— (iv)}$$

Put x_1, x_2, x_3 in eq (iv)

$$\Rightarrow \left(\frac{-10-\lambda}{4}\right) + \left(\frac{-8-\lambda}{2}\right) + \left(\frac{-6-\lambda}{6}\right) - 20 = 0$$

$$\Rightarrow \frac{-30-3\lambda-48-6\lambda-12-2\lambda}{12} - 20 = 0$$

$$\Rightarrow \frac{-90-11\lambda}{12} - 20 = 0$$

$$\Rightarrow -90-11\lambda-240 = 0$$

$$\Rightarrow -330-11\lambda = 0$$

$$\Rightarrow \boxed{\lambda = \frac{-330}{11}}$$

$$x_1 = \frac{-10+\frac{330}{11}}{4} = \frac{-110+330}{44} = \frac{220}{44} = 5$$

$$x_2 = \frac{-8+\frac{330}{11}}{2} = \frac{-88+330}{22} = \frac{242}{22} = 11$$

$$x_3 = \frac{-6+\frac{330}{11}}{6} = \frac{-66+330}{66} = \frac{264}{66} = 4$$

$L(x,\lambda) = (5, 11, 4 ; -30)$

$$H^B = \begin{bmatrix} O & U \\ U^T & V \end{bmatrix}$$

$$= \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 4 & 0 & 0 \\ 1 & 0 & 2 & 0 \\ 1 & 0 & 0 & 6 \end{bmatrix}$$

$$D_3 = \begin{vmatrix} 0 & 1 & 1 \\ 1 & 4 & 0 \\ 1 & 0 & 2 \end{vmatrix} = -1(2) + 1(-4)$$

$$= -2 - 4 = -6$$

$$D_4 = \begin{vmatrix} 0 & 1 & 1 & 1 \\ 1 & 4 & 0 & 0 \\ 1 & 0 & 2 & 0 \\ 1 & 0 & 0 & 6 \end{vmatrix} = -44$$

So, stationary point is our minimum point. i.e fn is convex function.