Sol

$$E = \frac{1}{2}(y_i - m_1 x_i - c)^2$$

$$\frac{dE}{\partial m_1} = -x_i^2(y_i - m_1 x_i^2 - m_2 x_i - c)$$

$$\frac{\partial E}{\partial m_2} = -x_i(y_i - m_1 x_i^2 - m_2 x_i - c)$$

$$\frac{\partial E}{\partial c} = -(y_i - m_1 x_i^2 - m_2 x_i - c)$$

$m_1 = 5, \ m_2 = 5, \ c = 90, \ \eta = 0.01, \ epochs = 1$

sample -1 :

$$\partial m_1 = -x_1^2(y_1 - m_1 x_1^2 - m_2 x_1 - c)$$

$$= -7.6^2(157 - 5(7.6)^2 - 5 \times 7.6 - 90)$$

$$= -(7.6)^2(157 - 288.8 - 38 - 20)$$

$$= -(7.6)^2(-189.8)$$

$$= 10962.848$$

$$\partial m_2 = -x_1(y_1 - m_1 x_1^2 - m_2 x_1 - c)$$

$$= -7.6(157 - 5(7.6)^2 - 5 \times 7.6 - 20)$$

$$= -7.6(157 - 288.8 - 38 - 20)$$

$$= -7.6(-189.8)$$

$$= 1442.48$$

$$\partial c = -(y_1 - m_1 x_1^2 - m_2 x_2 - c)$$

$$= -(157 - 5 \times 7.6^2 - 5 \times 7.6 - 20)$$

$$= -(157 - 288.8 - 38 - 20)$$

$$= 189.8 //$$

$m_1 = m_1 - \eta \times \Delta m_1$

$\quad = 5 - 0.01 \times 10962.848 = 104.62848$

$m_2 = m_2 - \eta \times \Delta m_2$

$\quad = 5 - 0.01 \times 142.48 = 3.5752$

$c = c - \eta \times \Delta c = 20 - 0.01 \times 189.8 = 18.102$

Sample-2 :- $\quad m_1 = 20, \; m_2 = 20, \; c = 10$

$\Delta m_1 = -x_2^2 (y_2 - m_1 x_2^2 - m_2 x_2 - c)$

$\quad = -7.1^2 (174 - 20(7.1)^2 - 20(7.1) - 10)$

$\quad = -7.1^2 (174 - 1008.2 - 142 - 10)$

$\quad = -7.1^2 (174 - -7.1^2(-986.2) = 49,714.342$

$\Delta m_2 = -7.1(174 - 20(7.1)^2 - 20(7.1) - 10)$

$\quad = -7.1(-986.2) = 7002.02$

$\Delta c = -(y_2 - m_1 x_2^2 - m_2 x_2 - c)$

$\quad = -(174 - 49714.342(7.1)^2 - (7002.02)(7.1) - 20)$

$\quad = -(174 - 2506082.74 - 49714.342 = 20)$

$\quad = 270169.082$

$m_1 = m_1 - \eta \times \Delta m_1 = 20 - 0.01 \times (49,714.342) = -477.1434$

$m_2 = m_2 - \eta \times \Delta m_2 = 20 - 0.01 \times (7002.02) = -50.0202$

$\Delta c = c - \eta \times \Delta c = 10 - 0.01 \times (270169.082) = -2691.690$