Question:

* At prize 15, and income 40, quantity demanded 36.
* At prize 20, and income 40, quantity demanded 21.
* At prize 15, and income 60, quantity demanded 40.

And given $Q_S = -7 + 2P$. Find P^*, Q^*.

Solution:

Here,

$P = 15, Q_d = 36, Y = 40$

$P = 15, Q_d = 40, Y = 60$

$P = 20, Q_d = 21, Y = 40$

$Q_d = a + bP + cY.$

$\therefore 36 = a + 15b + 40c \quad \ldots\ldots (i)$

$40 = a + 15b + 60c \quad \ldots\ldots (ii)$

$21 = a + 20b + 40c \quad \ldots\ldots (iii)$

(ii) - (i)

$40 - 36 = a + 15b + 60c - a - 15b - 40c$

$\Rightarrow 4 = 20c$

$\Rightarrow c = \frac{4}{20}$

$\therefore c = \frac{1}{5}$

(i) - (iii) ⇒

$$36 - 21 = a + 15b + 40c - a - 20b - 40c$$

$$\Rightarrow 15 = -5b$$

$$\therefore b = -3$$

Putting 'a' and 'b' 5 value in equ(i) ⇒

$$36 = a + 15(-3) + 40 \cdot \frac{1}{5}$$

$$\Rightarrow 36 = a - 45 + 8$$

$$\Rightarrow 36 = a - 37$$

$$\Rightarrow a = 36 + 37$$

$$\therefore a = 73$$

$$\therefore Q_5 = -7 + 2P$$

$$\therefore Q_d = 73 - 3P + \frac{1}{5}y$$

In Equilibrium state, we can write,

$$Q_d = Q_5$$

$$\therefore 73 - 3P + \frac{1}{5}y = -7 + 2P$$

$$\Rightarrow 73 + 7 + \frac{1}{5}y = 5P$$

$$\Rightarrow 5P = 80 + \frac{1}{5}y$$

$$\therefore P = 16 + \frac{1}{25}y$$

$$\therefore Q_5 = -7 + 2\left(16 + \frac{1}{25}y\right)$$

$$= -7 + 32 + \frac{2}{25}y$$

$$= 25 + \frac{2}{25}y$$

$$\therefore Q_d = 73 - 3\left(16 + \frac{1}{25}y\right) + \frac{1}{5}y$$

$$= 73 - 48 - \frac{3}{25}y + \frac{1}{5}y$$

$$= 25 + \frac{5y - 3y}{25}$$

$$= 25 + \frac{2y}{25}$$

$$\therefore P^* = 16 + \frac{1}{25}y$$

$$\therefore Q^* = 25 + \frac{2}{25}y.$$