Quiz # 1

Name = Khalid khan

ID = 7936

Section = B

Subject = DE

Question:-

A yam merchant sells brands A, B, C of yarn each of which is a blend of pakistani Egyptian and American cotton in the ratio 1:2:1, 2:1:1, 2:0:2 respectively. if one Kilogram of A, B, C costs, 40, 50 and 60 ruppes respectively. find the cost of a kilogram of cotton of each country

Solution:-

1:2:1, 2:1:1, 2:0:2

40

P	E
A	E

B_1

50

P	P
A	E

B_2

60

P	P
A	A

B_3

Let x, y and z be the cost/kg of pakistani, Egyptain and American cotton respectively Then according to the give conditions.

$$\left.\begin{aligned}\frac{1}{4}x+\frac{2}{4}y+\frac{1}{4}z&=40\\ \frac{2}{4}x+\frac{1}{4}y+\frac{1}{4}z&=50\\ \frac{2}{4}x+\frac{2}{4}z&=60\end{aligned}\right\}\cdots(5')$$

$$\left.\begin{aligned}1x+2y+1z&=160\\ 2x+1y+1z&=200\\ 1x+1z&=120\end{aligned}\right\}\cdots(5)$$

In matrix form, we can write it as.

$$\begin{bmatrix}1&2&1\\2&1&1\\1&0&1\end{bmatrix}\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}160\\200\\120\end{bmatrix}$$

$$A=\begin{bmatrix}1&2&1\\2&1&1\\1&0&1\end{bmatrix},\ \underline{x}=\begin{bmatrix}x\\y\\z\end{bmatrix},\ \underline{b}=\begin{bmatrix}160\\200\\120\end{bmatrix}$$

$$A\underline{x}=\underline{b}$$

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

$$A_1 \begin{bmatrix} 160 & 2 & 1 \\ 200 & 1 & 1 \\ 120 & 0 & 1 \end{bmatrix}$$

$$A_2 \begin{bmatrix} 1 & 160 & 1 \\ 2 & 200 & 1 \\ 1 & 120 & 1 \end{bmatrix}$$

$$A_3 \begin{bmatrix} 1 & 2 & 160 \\ 2 & 1 & 200 \\ 1 & 0 & 120 \end{bmatrix}$$

$|A| = -2$

$|A_1| = -120$

$$|A| = \begin{vmatrix} 1 & 2 & 1 \\ 2 & 1 & 1 \\ 1 & 0 & 1 \end{vmatrix} = 1(1\times1-0\times1)-2(2\times1-1\times1) + 1(2\times1-1\times1)$$

$$|A_1| = \begin{vmatrix} 160 & 2 & 1 \\ 200 & 1 & 1 \\ 120 & 0 & 1 \end{vmatrix} = 160(1\times1-0\times1)-2(200\times1-120\times1) + 1(200\times1-120\times1)$$

$|A_2| = -40$

$$|A_2| = \begin{vmatrix} 1 & 160 & 1 \\ 2 & 200 & 1 \\ 1 & 120 & 1 \end{vmatrix} = 1(200\times 1 - 120\times 1) - 160(2\times 1 - 1\times 1) + 1(2\times 1 - 1\times 200).$$

$|A_3| = 120$

$$|A_3| = \begin{vmatrix} 1 & 2 & 160 \\ 2 & 1 & 200 \\ 1 & 1 & 120 \end{vmatrix} = 1(1\times 120 - 0\times 200) - 2(2\times 120 - 1\times 200) + \cancel{2}160(2\times 120 - 1\times 1)$$

$|A| = -2,$

$|A_1| = -120, |A_2| = -40.$

$|A_3| = -120$

According to cramers rule

$$x = \frac{|A_1|}{|A|} = \frac{-120}{-2} = 60$$

$$y = \frac{|A_2|}{|A|} = \frac{-40}{-2} = 20.$$

$$z = \frac{|A_3|}{|A|} = \frac{-120}{-2} = 60$$

$$(x, y, z) = (60, 20, 60)$$