

NAME

JAWAD ALI

I.D

7351

Quiz

Differential Equations

Date

19-06-2020.

Q:

Ans

$x = A$, $y = B$ $z = 2x$

Let x, y & z be the cost/y/kg of pakistan, Egypt & America respectively

According to conditions

$\frac{1}{4}x + \frac{2}{4}y + \frac{1}{4}z = 40 \rightarrow (1)$

$\frac{2}{4}x + \frac{1}{4}y + \frac{1}{4}z = 50 \rightarrow (2)$

$\frac{2}{4}x + \frac{2}{4}z = 60 \rightarrow (3)$

Multiply 4 b/s on equations

(1) (2) and (3) we get

$(1) \Rightarrow x + 2y + z = 160$

$\Rightarrow 2x + y + z = 200$

$2x + y + z = 120$

Now we use the equations as Matrix form.

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

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

Now using Cramer's Rule.

$$A_{1x} = \begin{bmatrix} 160 & 2 & 1 \\ 200 & 1 & 1 \\ 120 & 0 & 1 \end{bmatrix} \text{ we just replace } \begin{matrix} \text{by in} \\ \text{of } A, \end{matrix} \text{ column.}$$

$$A_{1x} = 160 \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} - 2 \begin{bmatrix} 200 & 1 \\ 120 & 1 \end{bmatrix} + \begin{bmatrix} 200 & 1 \\ 120 & 0 \end{bmatrix}$$

$$= 160(1-0) - 2(200-120) + 1(0-120)$$

$$= 160 - 2(80) - 120 = 160 - 160 - 120$$

$$|A_{1x}| = -120$$

$$\text{Now } x = \frac{|A_{1x}|}{|A|} \rightarrow (4)$$

Now find $|A|$

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

$$= 1 - 2 - 1 = -2$$

Now (4)

$$x = \frac{|A_{1x}|}{|A|} = \frac{-120}{-2} = 60$$

$$\text{Also } x = A = 60$$

$$\text{Also } y = \frac{|A_1 y|}{|A_1|} = \textcircled{5}$$

$$A_1 y = \begin{bmatrix} 1 & 160 & 1 \\ 2 & 260 & 1 \\ 1 & 120 & 1 \end{bmatrix} \text{ just replace } B_1 \text{ in 2nd column of } A_1$$

$$|A_1 y| = 1(200 - 120) - 160(2 - 1) + 1(240 - 200)$$
$$= 80 - 160 + 40$$

$$|A_1 y| = -40$$

$$\textcircled{5} = y = \frac{|A_1 y|}{|A_1|} = \frac{-40}{-2} = 20$$

$$y = B = 20$$

again

$$z = \frac{|A_{12}|}{|A_1|} = 6$$

$$A_{12} = \begin{bmatrix} 1 & 2 & 160 \\ 2 & 1 & 200 \\ 1 & 0 & 120 \end{bmatrix}$$

$$|A_{12}| = 1(120 - 0) - 2(240 - 200) - 160(0 - 1)$$

$$= 120 - 80 - 160 = -120$$

$$\textcircled{6} \quad z = \frac{|A_{12}|}{|A_1|} = \frac{-120}{-2} = 60$$

$$z = C = 60$$

Hence

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

OR

$$(A, B, C) = (60, 20, 60)$$

it mean that

Pakistani blend cost/kg of cotton

$$= 60$$

Egyptian blend cost/kg of cotton

$$= 20$$

American blend cost/kg of cotton

$$= 60$$