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- ID NUMBER : 7930
- SECTION : "A" Civil Deptt
- SUBJECT : Numerical analysis
- SUBMITTED TO : Ma'am Shumaila
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QUESTION NO 1.1:

A Yarn merchant sells brands A, B, C of yarn each of which is blends of Pakistani, Egyption, American cotton in the ratio 2:1:1 , 2:1:1 , 2:0:2 respectivily If one Kilogram of A,B,C costs 40, 50, 60 rupees respectivily 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 Pakistan, Egyption, American cotton respectivily. Then accosding to the given Condition.

$$\left.\begin{aligned} \frac{1}{4}x + \frac{2}{4}y + \frac{1}{4}z &= 40 \\ \frac{2}{4}x + \frac{1}{4}y + \frac{1}{4}z &= 50 \\ \frac{2}{4}x + \frac{2}{4}z &= 60 \end{aligned}\right\} \Rightarrow \text{"A"}$$

(2)

$$1x + 2y + 1z = 160$$
$$2x + 1y + 1z = 200$$
$$1x + 0y + 1z = 120 \quad \Rightarrow B$$

IN MATRIX FORM, WE CAN WRITE AS:

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

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

$$AX = B$$

$$A_1 = \begin{bmatrix} 160 & 2 & 1 \\ 200 & 1 & 1 \\ 120 & 0 & 1 \end{bmatrix}, \quad A_2 = \begin{bmatrix} 1 & 160 & 1 \\ 2 & 200 & 1 \\ 1 & 120 & 1 \end{bmatrix}, \quad A_3 = \begin{bmatrix} 1 & 2 & 160 \\ 2 & 1 & 200 \\ 1 & 0 & 120 \end{bmatrix}$$

NOW!

$$|A| = \begin{vmatrix} 1 & 2 & 160 \\ 2 & 1 & 200 \\ 1 & 0 & 120 \end{vmatrix}$$ Expend by R_1

$$= 1 \begin{vmatrix} 1 & 1 \\ 0 & 1 \end{vmatrix} - 2 \begin{vmatrix} 2 & 1 \\ 1 & 1 \end{vmatrix} + 1 \begin{vmatrix} 2 & 1 \\ 1 & 0 \end{vmatrix}$$

$$= 1(1 \times 1 \times 0) - 2(2 \times 1 - 1 \times 1) + 1(2 \times 0 - 1 \times 1)$$
$$= -2$$

NOW!

$$|A_1| = \begin{vmatrix} 160 & 2 & 1 \\ 200 & 1 & 1 \\ 120 & 0 & 1 \end{vmatrix}$$ Expend by R_1

(3)

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

$|A_1| = -120$

Similarly:

$$|A_2| = \begin{vmatrix} 1 & 160 & 1 \\ 2 & 200 & 1 \\ 1 & 120 & 1 \end{vmatrix}$$ Expend by R_1

$$= 1 \begin{vmatrix} 200 & 1 \\ 120 & 1 \end{vmatrix} - 160 \begin{vmatrix} 2 & 1 \\ 1 & 1 \end{vmatrix} + 1 \begin{vmatrix} 2 & 200 \\ 1 & 120 \end{vmatrix}$$

$|A_2| = -40$

$$|A_3| = \begin{vmatrix} 1 & 2 & 160 \\ 2 & 1 & 200 \\ 1 & 0 & 120 \end{vmatrix}$$ Expend by R_1

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

$= 1(120 - 0) - 2(240 - 200) + 160(0 - 1)$

$|A_3| = -120$

NOW! ACCORDING TO CRAMER'S RULES.

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

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

$$z = |A_3|/|A| = -120/-2 = 60$$

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

- PAKISTANI = 60
- EGYPTIAN = 20
- AMERICAN = 60