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SECTION: B

QUIZ : I

"NUMERICAL ANALYSIS"

QUESTION NO 1

A yarn merchants sells brands A, B, C of yarn ---
 --- of each country?

GIVEN DATA:

Pakistani = 1:2:1

Egyptian = 2:1:1

American = 2:0:2

cost/kg

 $B_1 = \text{Rs. } 40$ $B_2 = \text{Rs. } 50$ $B_3 = \text{Rs. } 60$

REQUIRED:

Cost/kg of cotton of each
 country = ?

SOLUTION:

Let the cost/kg is x, y, z of Pakistani, Egyptian and American
So according to condition given;

$$\frac{1}{4}x + \frac{2}{4}y + \frac{1}{4}z = 40 \quad \text{--- i}$$

$$\frac{2}{4}x + \frac{1}{4}y + \frac{1}{4}z = 50 \quad \text{--- ii}$$

$$\frac{2}{4}x + \frac{2}{4}z = 60 \quad \text{--- iii}$$

In above equation multiply by 4 on both side

$$1x + 2y + 1z = 160$$

$$2x + 1y + 1z = 200$$

$$1x + 1z = 120$$

The above equations can be written in matrix form as;

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

$$A \quad \quad \quad x = B$$

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

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

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

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

Now finding determinant of all

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

$$= 1 - 2 - 1$$

$$|A| = -2$$

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

$$= 160 - 2 - 120$$

$$|A_1| = -2$$

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

$$= 80 - 160 + 40$$

$$|A_2| = -40$$

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

$$= 120 - 80 - 160$$

$$|A_3| = -120$$

According to cramer's rule

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

$$x = 60$$

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

$$y = 20$$

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

$$z = 60$$

RESULT:

cost 1kg of Pakistani = Rs. 60

cost 1kg of Egyptian = Rs. 20

cost 1kg of American = Rs. 60