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SECTION BE "B"

SEMESTER 4TH

SUBJECT DIFFERENTIAL EQUATIONS

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Solution:

As we know that

Ratio's

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

cost of A, B, C (Per kg is 40, 50, 60)

A = | P | E | / | A | E | = 40 → 1 : 2 : 1

B = | P | P | / | A | E | = 50 → 2 : 1 : 1

C = | P | P | / | A | A | = 60 → 2 : 0 : 2

x, y, z = Price of cotton

$$\left.\begin{aligned} \frac{1}{4}x + \frac{2}{4}y + \frac{1}{4}z &= 40 \\ \frac{2}{4}x + \frac{1}{4}y + \frac{1}{4}z &= 50 \\ \frac{2}{4}x + \frac{2}{4}z + \frac{0}{4}y &= 60 \end{aligned}\right\} \quad A$$

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

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

$$1x + 0y + 1z = 120$$

Now write in matrix form:

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

$$AX = B$$

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

$$A_1 = \begin{bmatrix} 160 & 2 & 1 \\ 200 & 1 & 1 \\ 1200 & 0 & 1 \end{bmatrix}$$

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

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

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

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

$|A_1| = -120$

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

$$|A_2| = 1(200 \times 1 - 120 \times 1) - 160(2 \times (-1 \times 1 + 1) (2 \times 1 - 1 \times 20)$$

$$|A_2| = -40$$

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

$$|A_3| = 1(1 \times 120).(0 \times 200) - 2(2 \times 120$$

$$- 1 \times 200) + 160(2 \times 12$$

$$x = \frac{|A_2|}{|A|}$$

$$x = \frac{-40}{-2}$$

$$x = 20 .$$

$$x = \frac{|A_3|}{|A|}$$

$$x = \frac{-120}{-2}$$

$$x = 50$$

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