RAVI MATHS TUITION CENTER, GKM COLONY, CH-82. PH- 8056206308

12 th BM MATRIX 2 MARKS TEST 2

12th Standard 2019 EM

Date : 09-Jun-19

Business Maths

Reg.No. : | | | | | | |

Time : 00:30:00 Hrs

Total Marks : 20

10 x 2 = 20

1) Show that the equations $5x+3y+7z=4, 3x+26y+2z=9, 7x+2y+10z=5$ are consistent and solve them by rank method.

2) The price of three commodities X,Y and Z are x,y and z respectively Mr.Anand purchases 6 units of Z and sells 2 units of X and 3 units of Y. Mr.Amar purchases a unit of Y and sells 3 units of X and 2units of Z. Mr.Amit purchases a unit of X and sells 3 units of Y and a unit of Z. In the process they earn `5,000/-, `2,000/- and `5,500/- respectively Find the prices per unit of three commodities by rank method.

3) Solve the following equations by using Cramer's rule
$2x + 3y = 7; 3x + 5y = 9$

4) A total of Rs 8,600 was invested in two accounts. One account earned $4\frac{3}{4}$% annual interest and the other earned $6\frac{1}{2}$% annual interest. If the total interest for one year was Rs 431.25, how much was invested in each account? (Use determinant method).

5) A total of Rs 8,500 was invested in three interest earning accounts. The interest rates were 2%, 3% and 6% if the total simple interest for one year was Rs 380 and the amount ,invested at 6% was equal to the sum of the amounts in the other two accounts, then how much was invested in each account? (use Cramer's rule).

6) Two types of soaps A and B are in the market. Their present market shares are 15% for A and 85% for B. Of those who bought A the previous year, 65% continue to buy it again while 35% switch over to B. Of those who bought B the previous year, 55% buy it again and 45% switch over to A. Find their market shares after one year and when is the equilibrium reached?

7) Find the rank of the matrix $A = \begin{pmatrix} -2 & 1 & 3 & 4 \\ 0 & 1 & 1 & 2 \\ 1 & 3 & 4 & 7 \end{pmatrix}$

8) Find k if the equations $2x+3y-z=5, 3x-y+4z=2, x+7y-6z=k$ are consistent.

9) The cost of 2kg. of wheat and 1kg. of sugar is Rs 100. The cost of 1kg. of wheat and 1kg. of rice is Rs 80. The cost of 3kg. of wheat, 2kg. of sugar and 1kg of rice is Rs 220. Find the cost of each per kg., using Cramer's rule.

10) Solve the following equation by using Cramer's rule
$x + 4y + 3z = 2, 2x-6y + 6z=-3, 5x- 2y + 3z =-5$

****

10 x 2 = 20

1) Given non-homogeneous equations are

$5x+ 3y + 7z = 4$

$3x + 26y + 2z = 9$

$7x + 2y + 10z = 5$

The matrix equation corresponding to the given system is

$$\begin{pmatrix} 5 & 3 & 7 \\ 3 & 26 & 2 \\ 7 & 2 & 10 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 4 \\ 9 \\ 5 \end{pmatrix}$$

Augmented matrix [A, B]	Elementary Transformation

Augmented matrix [A, B]	Elementary Transformation
$\begin{pmatrix} 5 & 3 & 7 & 4 \\ 3 & 26 & 2 & 9 \\ 7 & 2 & 10 & 5 \end{pmatrix}$	
$\sim \begin{pmatrix} 3 & 26 & 2 & 9 \\ 5 & 3 & 7 & 4 \\ 7 & 2 & 10 & 5 \end{pmatrix}$	$R_1 \leftrightarrow R_2$
$\begin{pmatrix} 1 & \frac{26}{3} & \frac{2}{3} & 3 \\ 5 & 3 & 7 & 4 \\ 7 & 2 & 10 & 5 \end{pmatrix}$	$R_1 \to R_1 \div 3$
$\begin{pmatrix} 1 & \frac{26}{3} & \frac{2}{3} & 3 \\ 0 & \frac{-121}{3} & \frac{11}{3} & -11 \\ 7 & 2 & 5 & 5 \end{pmatrix}$	$R_2 \to R_2 - 5R_1$
$\begin{pmatrix} 1 & \frac{26}{3} & \frac{2}{3} & 3 \\ 0 & \frac{-121}{3} & \frac{11}{3} & -11 \\ 0 & \frac{-176}{3} & \frac{16}{3} & -16 \end{pmatrix}$	$R_3 \to R_3 - 7R_1$
$\sim \begin{pmatrix} 1 & \frac{26}{3} & \frac{2}{3} & 3 \\ 0 & \frac{-11}{3} & \frac{1}{3} & -1 \\ 0 & \frac{-11}{3} & \frac{1}{3} & -1 \end{pmatrix}$	$R_2 \to R_2 \div 11$ $R_3 \to R_3 \div 16$
$\begin{pmatrix} 1 & \frac{26}{3} & \frac{2}{3} & 3 \\ 0 & \frac{-11}{3} & \frac{1}{3} & -1 \\ 0 & 0 & 0 & 0 \end{pmatrix}$	$R_3 \to R_3 - R_2$

Here $\rho(A) = \rho(A, B) = 2 < Number of unknowns.$

∴ The system is consistent with infinitely many solutions let us rewrite the above echelon form into matrix form

$$\begin{pmatrix} 1 & \frac{26}{3} & \frac{2}{3} \\ 0 & \frac{-11}{3} & \frac{1}{3} \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 \\ -1 \\ 0 \end{pmatrix}$$

$$x + \frac{26}{3}y + \frac{2}{3}z = 3$$

$x + \frac{26}{3}y + \frac{2}{3}z = 3$

|letz = k where kE R

(2) $\Rightarrow \frac{-11}{3}y + \frac{k}{3} = -1$ $\Rightarrow$ $\frac{-11}{3}y = -1 - \frac{k}{3} = \frac{-3-k}{3}$

$\Rightarrow$ $-11y = -3 - k$ 11y=3+k

$\Rightarrow$ $y = \frac{1}{11}(3 + k)$

Substituting $y = \frac{1}{11}(3 + k)$ and z = kin (1) we get,

$x + \frac{26}{3}\left(\frac{3+k}{11}\right) + \frac{2}{3}k = 3$

$= \frac{26}{3}\left(\frac{3+k}{11}\right) - \frac{2k}{3} + 3$

$\frac{78-26k}{33} - \frac{2k}{3} + 3$

$\frac{78-26k-22k+99}{33}$

$\frac{78-26k-22k+99}{33}$

$\frac{21-48k}{33} = \frac{3(7-16k)}{33}$

$= \frac{1}{11}(7 - 6k)$

$\therefore$ Solution set is $\left\{\frac{1}{11}(7-16k). \frac{1}{11}(3+k), k\right\}^{K}$ ϵ R

Hence, for different values of k, we get infinitely many solutions.

2) Given that the price of commodities X, Y and Z are x, y and z respectively

By the given data

Transaction	x	y	z	Earning
Mr. Anand	+2	+3	-6	Rs.5000
Mr. Amar	+3	-1	+2	Rs.2000
Mr. Amit	-1	+3	+1	Rs.5500

Here, purchasing is taken as negative symbol and selling is taken as positive symbol

Thus, the non-homogeneous equations are

2x + 3y - 6z = 5000

3x - y + 2z = 2000

-x + 3y + z = 550

The matrix equation corresponding to the given system is

$$\begin{pmatrix} 2 & 3 & -6 \\ 3 & -1 & 2 \\ -1 & 3 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 5000 \\ 2000 \\ 5500 \end{pmatrix}$$

Augmented matrix	Elementary Transformation
Augmented matrix	Elementary Transformation

$\begin{pmatrix} 2 & 3 & -6 & 5000 \\ 3 & -1 & 2 & 2000 \\ -1 & 3 & 1 & 5500 \end{pmatrix}$	
$\begin{pmatrix} -1 & 3 & 1 & 5500 \\ 3 & -1 & 2 & 2000 \\ 2 & 3 & -6 & 5000 \end{pmatrix}$	R_1 ⊠ R_3
$\begin{pmatrix} 1 & -3 & -1 & -5000 \\ 3 & -1 & 2000 & 2000 \\ 2 & 3 & -6 & 5500 \end{pmatrix}$	$R_1 \rightarrow R_1(-1)$
$\begin{pmatrix} 1 & -3 & -1 & -5500 \\ 0 & 8 & 5 & 18500 \\ 0 & 9 & -4 & 16000 \end{pmatrix}$	$R_2 \rightarrow r_2 - 3R_1$ $R_3 \rightarrow R_3 - 2R_1$
$\begin{pmatrix} 1 & -3 & -1 & -5500 \\ 0 & 1 & \frac{65}{8} & \frac{18500}{8} \\ 0 & 1 & \frac{-4}{9} & \frac{16000}{9} \end{pmatrix}$	$R_2 \rightarrow R_2 \div 8$ $R_3 \rightarrow R_3 \div 9$
$\begin{pmatrix} 1 & -3 & -1 & -5500 \\ 0 & 1 & \frac{5}{8} & \frac{18500}{8} \\ 0 & 0 & \frac{-4}{9} - \frac{5}{8} & \frac{16000}{9} - \frac{18500}{8} \end{pmatrix}$	$R_3 \rightarrow R_3 - R_2$
$\begin{pmatrix} 1 & -3 & -1 & -5500 \\ 0 & 1 & \frac{5}{8} & \frac{18500}{8} \\ 0 & 0 & \frac{-77}{72} & \frac{-38500}{72} \end{pmatrix}$	

.Clearly the last equivalent matrix is in echelon form and it has three non-zero rows . . :. $\therefore \rho(A) = \rho([A, B]) = 3$ Number of unknowns. $\therefore$ The given system is consistent and has unique solution. To find the solution, let us rewrite the above : echelon form into the matrix form.

$$\begin{pmatrix} 1 & -3 & -1 \\ 0 & 1 & \frac{5}{8} \\ 0 & 0 & \frac{-77}{72} \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} \begin{pmatrix} -5000 \\ \frac{18500}{8} \\ \frac{-38500}{72} \end{pmatrix}$$

$\Rightarrow x - 3y - z = -5500$

$y + \frac{5}{8}z = \frac{18500}{8}$

$\frac{-77}{72}z = \frac{38500}{72}$

$(3) \Rightarrow \frac{-77z}{72} = \frac{-38500}{72}$

$\Rightarrow z = \dfrac{-38500}{-77}$

$\Rightarrow z = 500$

(2) $\Rightarrow y + \dfrac{5}{8}(500) = \dfrac{18500}{8} \quad y = \dfrac{18500}{8} - \dfrac{2500}{8}$

$= \dfrac{\overset{2000}{\cancel{16000}}}{\cancel{8}} \quad \Rightarrow y = 2000$

(1) $\Rightarrow x - 3(2000) - 500 = -5500$

$\Rightarrow x - 6000 - 500 = -5500$

$\Rightarrow x - 6000 - 500 = -5500$

$\Rightarrow x = -5500 + 6500$

$\Rightarrow x = 10000$

Hence, the prices per unit of three commodities are Rs1000, Rs 2000 and Rs500 respectively

3)

$\Delta = \begin{vmatrix} 2 & 3 \\ 3 & 5 \end{vmatrix} = 10 - 9 = 1 \neq 0$

Since $\Delta \neq 0$ we can apply Cramer's rule and the system is consistent with unique solution.

$\Delta x = \begin{vmatrix} 7 & 3 \\ 9 & 5 \end{vmatrix} = 7(5) - 9(3)$

$= 35 - 27 = 8$

$\Delta y = \begin{vmatrix} 2 & 7 \\ 3 & 9 \end{vmatrix} = 2(9) - 3(7)$

$= 18 - 21 = -3$

$\therefore x = \dfrac{\Delta x}{\Delta} = \dfrac{8}{1} = 8$

$y = \dfrac{\Delta y}{\Delta} = \dfrac{-3}{1} = 3$

$\therefore$ Solution set is {8, -3)

4) Let the amount invested in the two accounts be Rs x and Rs. y respectively

By the given data, x + y = 8600 ..(1)

$$4\frac{3}{4} \times \frac{x}{100} + 6\frac{1}{2} \times \frac{y}{100} = 431.25 \left[\therefore interest = \frac{PNR}{100}\right]$$

$$\Rightarrow \frac{19x}{400} + \frac{13y}{3200} = 431.25$$

$$\Rightarrow \frac{19x + 26y}{400} = 431.25$$

19x + 26y = 172500 ...(2)

$$\Delta = \begin{vmatrix} 1 & 1 \\ 19 & 26 \end{vmatrix} = 1(26) - 1(19)$$

= 26-19 =7

$$\Delta x = \begin{vmatrix} 8600 & 1 \\ 172500 & 26 \end{vmatrix} = 8600(26) - 1(172500)$$

= 223600 - 172500= 51100

$$\Delta y = \begin{vmatrix} 1 & 8600 \\ 19 & 172500 \end{vmatrix} = 1(172500) - 19(8600)$$

= 172500 - 163400 = 9100

$$x = \frac{\Delta x}{\Delta} - \frac{51100}{7} = 7300$$

$$y = \frac{\Delta y}{\Delta} = \frac{9100}{7} = 1300$$

$\therefore$ Investment in the interest of $4\frac{3}{4}$ % account is Rs. 7300 and investment in the rate of $6\frac{1}{2}$ account is Rs. 1300.

5) Let the amount invested in the rate of2%, 3% and 6% be Rs. x, Rs. y and Rs. z respectivly

By the given data,

x+ y+z = 8500

$$\frac{2x}{100} + \frac{3y}{100} + \frac{6z}{100} = 380$$

$$\Rightarrow \frac{2x + 3y + 6z}{100} = 380$$

$$\because Interest = \frac{PNR}{100} = \frac{x \times 1 \times 2}{100} = \frac{2x}{100}$$

$$\Rightarrow 2x + 3y + 6z = 38000$$

Also,z = x+y

x+y-z =0

$$\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 2 & 3 & 6 \\ 1 & 1 & -1 \end{vmatrix}$$

$$1 \begin{vmatrix} 3 & 6 \\ 1 & -1 \end{vmatrix} - 1 \begin{vmatrix} 2 & 6 \\ 1 & -1 \end{vmatrix} + 1 \begin{vmatrix} 2 & 3 \\ 1 & 1 \end{vmatrix}$$

= 1(-3 - 6) - 1(-2 -6) + 1 (2 - 3)

= 1(-9) - 1 (-8) + 1(-1)

= -9+8-1=2 $\neq$ 0

Since $\Delta \neq 0$ Cramer's rule can be applied and the system is consistent with unique solution

Since $\Delta \neq 0$, Cramer's rule can be applied and the system is consistent with unique solution

$$\Delta x = \begin{vmatrix} 8500 & 1 & 1 \\ 38000 & 3 & 6 \\ 0 & 1 & -1 \end{vmatrix}$$

$$= 8500 \begin{vmatrix} 3 & 6 \\ 1 & -1 \end{vmatrix} - 1 \begin{vmatrix} 38000 & 6 \\ 1 & -1 \end{vmatrix} + 1 \begin{vmatrix} 38000 & 3 \\ 0 & 1 \end{vmatrix}$$

= 8500 (- 3 - 6) - 1(-38000 -0) + 1(38000 - 0)

= 8500(-9) - 1(-38000) + 1(38000)

= - 76500 + 38000 + 38000

= -500

$$\Delta y = \begin{vmatrix} 1 & 8500 & 1 \\ 2 & 38000 & 6 \\ 1 & 0 & -1 \end{vmatrix}$$

$$= 1 \begin{vmatrix} 38000 & 6 \\ 0 & -1 \end{vmatrix} - 8500 \begin{vmatrix} 2 & 6 \\ 1 & -1 \end{vmatrix} + 1 \begin{vmatrix} 2 & 38000 \\ 1 & 0 \end{vmatrix}$$

= 1 (-38000 - 0) - 8500 (-2 -6) + 1(0 - 38000)

= - 38000 - 8500 (-8) - 38000

= - 38000 + 68000 - 38000

= - 8000

$$\Delta z = \begin{vmatrix} 1 & 1 & 8500 \\ 2 & 3 & 38000 \\ 1 & 1 & 0 \end{vmatrix}$$

$$= 1 \begin{vmatrix} 38000 & 6 \\ 0 & -1 \end{vmatrix} - 1 \begin{vmatrix} 2 & 38000 \\ 1 & 0 \end{vmatrix} + 8500 \begin{vmatrix} 2 & 3 \\ 1 & 1 \end{vmatrix}$$

= 1 (0 - 38000) - 1(0 -38000) +85000 (2 - 3)

= - 38000 + 38000 + 8500 (-1)

= - 8500

$$\therefore x = \frac{\Delta x}{\Delta} = \frac{-500}{-2} = +250$$

$$y = \frac{\Delta y}{\Delta} = \frac{-8000}{-2} = 4000$$

$$z = \frac{\Delta z}{\Delta} = \frac{-8500}{-2} = 4250$$

Hence, the amount invested in the three accounts are Rs. 250, Rs. 4000 and Rs. 4250 respectively.

6) Transition probability matrix

(A B) T = (A B)

$$T = \begin{matrix} & \begin{matrix} A & B \end{matrix} \\ \begin{matrix} A \\ B \end{matrix} & \begin{pmatrix} \cdot 65 & \cdot 35 \\ \cdot 45 & \cdot 55 \end{pmatrix} \end{matrix}$$

Where A represents the percent of people those who bought soap A and B represents the percent of people those who bought soap B.

By the given data

A = 15%=·15

and B = 85% = ·85

Percentage after one year is

$$(\cdot 15 \quad \cdot 85)\begin{pmatrix} \cdot 65 & \cdot 35 \\ \cdot 45 & \cdot 55 \end{pmatrix}$$

= ((.15)(·65) + (·85)(-45) ·15(-35)+ ·85(-55))

= (-0975 + ·3825 ·0525 + -4675)

= (-48 ·52)

Hence, market share after one year is 48% and 52%

At equilibrium,

$$(A \quad B)\begin{pmatrix} \cdot 65 & \cdot 35 \\ \cdot 45 & \cdot 55 \end{pmatrix} = (A \quad B)$$

(-65A+A5B ·35A+·55B) = (A B)

Equating the corresponding entries on both sides

we get

$\Rightarrow \cdot 65A + \cdot 45B = A$

$\Rightarrow \cdot 65A + \cdot 45(1 - A) = A$

[Since A+B = 1 =} B= 1-A]

$\Rightarrow \cdot 65A + \cdot 45 - \cdot 45A = A$

$\Rightarrow \cdot 45 = A - \cdot 65A + \cdot 45A$

$\Rightarrow \cdot 45 = A(\cdot 35 + 45)$

$\Rightarrow \cdot 45 = A(\cdot 35 + 45)$

$\Rightarrow \cdot 45 = A(-8)$

$\Rightarrow A = \frac{\cdot 45}{\cdot 8} = \cdot 5625 = 56.25$

$\therefore B = 1 - A = 1 - \cdot 5625 = \cdot 4375$

= 43.75%

∴ Equilibrium is reached when A = 56.25% and B = 43.75%

7) Given A = $\begin{pmatrix} -2 & 1 & 3 & 4 \\ 0 & 1 & 1 & 2 \\ 1 & 3 & 4 & 7 \end{pmatrix}$

$\sim \begin{pmatrix} 1 & 3 & 4 & 7 \\ 0 & 1 & 1 & 2 \\ -2 & 1 & 3 & 4 \end{pmatrix} R_1 \rightarrow R_3$

$\sim \begin{pmatrix} 1 & 3 & 4 & 7 \\ 0 & 1 & 1 & 2 \\ 0 & 7 & 11 & 18 \end{pmatrix} R_2 \rightarrow R_2 + 2R_1$

$\sim \begin{pmatrix} 1 & 3 & 4 & 7 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 4 & 4 \end{pmatrix} R_3 \rightarrow R_3 - 7R_2$

The last equivalent matrix is in echelon form and there are 3 non - zero rows.

$\therefore \rho(A) = 3$

8) Given non-homogeneous equations are

2x + 3y - z = 5, 3x - y + 4z = 2, x + 7y - 6z = k

Augmented matrix	**Elementary Transformation**
$\begin{pmatrix} 2 & 3 & -1 & 5 \\ 3 & -1 & 4 & 2 \\ 1 & 7 & -6 & k \end{pmatrix}$	
$\begin{pmatrix} 1 & 7 & -6 & k \\ 3 & -1 & 4 & 2 \\ 2 & 3 & -1 & 5 \end{pmatrix}$	$R_1 \leftrightarrow R_3$
$\begin{pmatrix} 1 & 7 & -6 & k \\ 0 & -22 & 22 & 2-3k \\ 0 & -11 & 11 & 5-2k \end{pmatrix}$	$R_2 \rightarrow R_2 - 3R_1$
$\begin{pmatrix} 1 & 7 & -6 & k \\ 0 & -22 & 22 & 2-3k \\ 0 & 0 & 0 & 2(5-2k)-(2-3k) \end{pmatrix}$	$R_2 \rightarrow R_2 - 3R_1$ $R_3 \rightarrow R_3 - 2R_1$
$\begin{pmatrix} 1 & 7 & -6 & k \\ 0 & -22 & 22 & 2-3k \\ 0 & 0 & 0 & 10-4k-2+3k \end{pmatrix}$	$R_3 \rightarrow 2R_3 - R_2$
$\begin{pmatrix} -1 & 7 & -6 & k \\ 0 & -22 & 22 & 2-3k \\ 0 & 0 & 0 & 8-k \end{pmatrix}$	

Here $\rho(A) = 2$

Since the given system is consistent, ρ(A, B) must be equal to 2.

This can happen only when

8-k=0 $\Rightarrow$ k=8

9) Let the cost of lkg of wheat be Rs. x, lkg of sugar be Rs. y and lkg of rice be Rs. z.

By the given data,

2x+ Y = 100

x +z = 80

3x+ 2y+z = 220

$$\Delta = \begin{vmatrix} 2 & 1 & 0 \\ 1 & 0 & 1 \\ 3 & 2 & 1 \end{vmatrix} = 2\begin{vmatrix} 0 & 1 \\ 2 & 1 \end{vmatrix} - 1\begin{vmatrix} 1 & 1 \\ 3 & 1 \end{vmatrix} + 0$$

= 2 (0 - 2) -1 (1 - 3) + 0

= 2(-2) - 1(- 2)

= - 4 + 2 =-2

$$\Delta x = \begin{vmatrix} 100 & 1 & 0 \\ 80 & 0 & 1 \\ 220 & 2 & 1 \end{vmatrix} = 100\begin{vmatrix} 0 & 1 \\ 2 & 1 \end{vmatrix} - 1\begin{vmatrix} 80 & 1 \\ 220 & 1 \end{vmatrix} + 0$$

= 100(0 - 2) - 1 (80 - 220)

= 100(- 2) - 1(- 140)

= - 200 + 140 = - 60.

$$\Delta y = \begin{vmatrix} 2 & 100 & 0 \\ 1 & 80 & 1 \\ 3 & 220 & 1 \end{vmatrix} = 2\begin{vmatrix} 80 & 1 \\ 220 & 1 \end{vmatrix} - 100\begin{vmatrix} 1 & 1 \\ 3 & 1 \end{vmatrix} + 0$$

= 2 (80 - 220) - 100 (1 - 3)

= 2 (- 140) - 100 (-2)

= - 280 + 200 = - 80.

$$\Delta z = \begin{vmatrix} 2 & 1 & 100 \\ 1 & 0 & 80 \\ 3 & 2 & 220 \end{vmatrix}$$

$$2\begin{vmatrix} 0 & 80 \\ 2 & 220 \end{vmatrix} - 1\begin{vmatrix} 1 & 80 \\ 3 & 220 \end{vmatrix} + 100\begin{vmatrix} 1 & 0 \\ 3 & 2 \end{vmatrix}$$

= 2(0 - 160) - 1(220 - 240) + 100(2 - 0)

= 2(- 160) - 1(- 20) + 100(2)

= - 320 + 20 + 200

= -100

$$x = \frac{\Delta x}{\Delta} = \frac{-60}{-2} = 30$$

$$y = \frac{\Delta y}{\Delta} = \frac{-80}{-2} = 40$$

$$z = \frac{\Delta z}{\Delta} = \frac{-100}{-2} = 50$$

∴ The cost of lkg of wheat is Rs.30

The cost of lkg sugar is Rs.40 and

The cost of 1 kg of rice is Rs.50

10)

$$\Delta = \begin{vmatrix} 1 & 4 & 3 \\ 2 & -6 & 6 \\ 5 & -2 & 3 \end{vmatrix}$$

$$= 1\begin{vmatrix} -6 & 6 \\ -2 & 3 \end{vmatrix} - 4\begin{vmatrix} 2 & 6 \\ 5 & 3 \end{vmatrix} + 3\begin{vmatrix} 2 & -6 \\ 5 & -2 \end{vmatrix}$$

= 1(-18 + 12) - 4(6 - 30) +3 (- 4 +30)

= 1(- 6) - 4(- 24) + 3(26)

= - 6 + 96 + 78 = 168 $\neq$ 0

Since $\Delta \neq 0$ the system is consistent with unique solution and Cramer's rule can be applied

$$\Delta x = \begin{vmatrix} 2 & 4 & 3 \\ -3 & -6 & 6 \\ -5 & -2 & 3 \end{vmatrix}$$

$$= 2\begin{vmatrix} -6 & 6 \\ -2 & 3 \end{vmatrix} - 4\begin{vmatrix} -3 & 6 \\ -5 & 3 \end{vmatrix} + 3\begin{vmatrix} -3 & -6 \\ -5 & -2 \end{vmatrix}$$

= 2 (- 18 + 12) - 4(- 9 +30) + 3(6 -30)

= 2(- 6) - 4(21) + 3(- 24)

= -12-84-72=-168

$$\Delta y = \begin{vmatrix} 1 & 2 & 3 \\ 2 & - & 6 \\ 5 & -5 & 3 \end{vmatrix} = 1\begin{vmatrix} -3 & 6 \\ -5 & 3 \end{vmatrix} - 2\begin{vmatrix} 2 & 6 \\ 5 & 3 \end{vmatrix} + 3\begin{vmatrix} 2 & -3 \\ 5 & -5 \end{vmatrix}$$

= 1 (-9+30)-2(6-30)+3(- 10+ 15)

= 1(21) - 2(- 24) + 3(5)

= 21 + 48 + 15 = 84

$$\Delta z = \begin{vmatrix} 1 & 4 & 2 \\ 2 & -6 & -3 \\ 5 & -2 & -5 \end{vmatrix}$$

$$= 1\begin{vmatrix} -6 & -3 \\ -2 & -5 \end{vmatrix} - 4\begin{vmatrix} 2 & -3 \\ 5 & -5 \end{vmatrix} + 2\begin{vmatrix} 2 & -6 \\ 5 & -2 \end{vmatrix}$$

= 1(30-6)-4(-10+ 15)+2(-4+30)

= 24 - 4(5) + 2(26)

= 24 - 20 + 52 = 56

$$x = \frac{\Delta x}{\Delta} = \frac{-168}{168} = -1$$

$$y = \frac{\Delta y}{\Delta} = \frac{84}{168_{2}} = \frac{1}{2}$$

$$z = \frac{\Delta z}{\Delta} = \frac{56}{168_{3}} = \frac{1}{3}$$

Solution set is $\left\{-1, \frac{1}{2}, \frac{1}{3}\right\}$