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Questions:

5 Marks

1. Two commodities A and B are produced such that 0.4 tonne of A and 0.7 tonne of B are required to produce a tonne of A. Similarly 0.1 tonne of A and 0.7 tonne of B are needed to produce a tonne of B. Write down the technology matrix. If 68 tonnes of A and 10.2 tonnes of B are required, find the gross production of both of them.

2. Suppose the inter-industry flow of the product of two industries are given as under.

Production sector	Consumption sector		Domestic demand	Total output
	X	Y		
X	30	40	50	120
Y	20	10	30	60

Determine the technology matrix and test Hawkin's -Simon conditions for the viability of the system. If the domestic demand changes to 80 and 40 units respectively, what should be the gross output of each sector in order to meet the new demands.

3. The cost of 2 Kg of Wheat and 1 Kg of Sugar is Rs.70. The cost of 1 Kg of Wheat and 1 Kg of Rice is Rs.70 The cost of 3 Kg of Wheat, 2 Kg of Sugar and 1 Kg of rice is Rs.170. Find the cost of per kg each item using matrix inversion method.

4. The data are about an economy of two industries A and B. The values are in crores of rupees.

Producer	User		Final demand	Total output
	A	B		
A	50	75	75	200
B	100	50	50	200

Find the output when the final demand changes to 300 for A and 600 for B.

5. Solve by matrix inversion method: 3x - y + 2z = 13 ; 2x + Y - z = 3 ; x + 3y - 5z = - 8.

6. Solve by matrix inversion method: x - y + 2z = 3; 2x + z = 1; 3x + 2y + z = 4.

7. Solve by matrix inversion method : 2x - z = 0; 5x + y = 4; y + 3z = 5.

8. The prices of three commodities A, B and C are Rs. x, Rs. y and Rs. z per unit respectively. P purchases 4 units of C and sells 3 units of A and 5 units of B. Q purchases 3 units of B and sells 2 units of A and 1 unit of C. R purchases 1 unit of A and sells 4 units of B and 6 units of C. In the process P, Q and R earn Rs. 6,000, Rs. 5000, and Rs. 13000 respectively. By using matrix inversion method, find the prices per unit of A, B and C.

9. The sum of three numbers is 20. If we multiply the first by 2 and add the second number and subtract the third we get 23. If we multiply the first by 3 and add second and third to it, we get 46. By using matrix inversion method find the numbers.

10. Weekly expenditure in an office for three weeks is given as follows. Assuming that the salary in all the three weeks of different categories of staff did not vary, calculate the salary for each type of staff, using matrix inversion method.

Week	Number of employees			Total weekly Salary (in rupees)
	A	B	C	
1st week	4	2	3	4900
2nd week	3	3	2	4500
3rd week	4	3	4	5800

11. The cost of 4 kg onion, 3 kg wheat and 2 kg rice is Rs.320. The cost of 2kg onion, 4 kg wheat and 6 kg rice is Rs.560. The cost of 6 kg onion, 2 kg wheat and 3 kg rice is Rs. 380. Find the cost of each item per kg by matrix inversion method.

12. An economy produces only coal and steel. These two commodities serve as intermediate inputs in each other's production. 0.4 tonne of steel and 0.7 tonne of coal are needed to produce a tonne of steel. Similarly 0.1 tonne of steel and 0.6 tonne of coal are required to produce a tonne of coal. No capital inputs are needed. Do you think that the system is viable? 2 and 5 labour days are required to produce a tonnes of coal and steel respectively. If economy needs 100 tonnes of coal and 50 tonnes of steel, calculate the gross output of the two commodities and the total labour days required.

3 Marks

13. Find |AB| if $A = \begin{bmatrix} 3 & -1 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 \\ 1 & -2 \end{bmatrix}$

14. Solve: $\begin{vmatrix} 7 & 4 & 11 \\ -3 & 5 & x \\ -x & 3 & 1 \end{vmatrix} = 0$

15. Solve: $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0.$

16. Evaluate $\begin{vmatrix} 10041 & 10042 & 10043 \\ 10045 & 10046 & 10047 \\ 10049 & 10050 & 10051 \end{vmatrix}$

17. Without actual expansion show that the value of the determinant $\begin{vmatrix} 5 & 5^2 & 5^3 \\ 5^2 & 5^3 & 5^4 \\ 5^4 & 5^5 & 5^6 \end{vmatrix}$ is zero.

18. Solve by matrix inversion method: 2x + 3y - 5 = 0, x - 2y + 1 = 0.

19. The following inter – industry transactions table was constructed for an economy of the year 2016

Industry	1	2	Final consumption	Total output
1	500	1,600	400	2,500
2	1,750	1,600	4,650	8,000
Labours	250	4,800	-	-

Construct technology co-efficient matrix showing direct requirements. Does a solution exist for this system.

2 Marks

20. Suppose the inter-industry flow of the product of two sectors X and Y are given as under.

Production Sector	Consumption Sector		Domestic demand	Gross output
	X	Y		
X	15	10	10	35
Y	20	30	15	65

Find the gross output when the domestic demand changes to 12 for X and 18 for Y.

21. The technology matrix of an economic system of two industries is $\begin{bmatrix} 0.50 & 0.30 \\ 0.41 & 0.33 \end{bmatrix}$. Test whether the system is viable as per Hawkins Simon conditions.

22. The technology matrix of an economic system of two industries is $\begin{bmatrix} 0.6 & 0.9 \\ 0.20 & 0.80 \end{bmatrix}$ .Test whether the system is viable as per Hawkins-Simon conditions.

23. The technology matrix of an economic system of two industries is $\begin{bmatrix} 0.50 & 0.25 \\ 0.40 & 0.67 \end{bmatrix}$. Test whether the system is viable as per Hawkins-Simon conditions.

24. Find the minors and cofactors of all the elements of the following determinants $\begin{vmatrix} 5 & 20 \\ 0 & -1 \end{vmatrix}$

25. The technology matrix of an economic system of 2 industries is $\begin{pmatrix} \frac{1}{2} & \frac{1}{4} \\ \frac{2}{5} & \frac{2}{3} \end{pmatrix}$. Test whether the system is viable as per Hawkins simon conditions.

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