MATHS

BOOKS - SHARAM PUBLICATION

LINEAR PROGRAMMING

Example

1. Find the feasible region of the system.

$2y - x \geq 0, 6y - 3x \leq 21, x \geq 0, y \geq 0$

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2. Shade the feasible region for the inequations $2x + 3y \leq 6, x \geq 0, y \geq 0$ in a rough figure.

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3. Show that feasible region for the following constarints in a graph $2x + y \leq 4, x \geq 0 y \geq 0.$

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4. State the feasible solution.

5. Mention the quadrant in which the solution of an LPP with two decision variables lies when the graphical method is adopted.

6. Write the solution of the following LPP

Maximise $Z = x + y$

Subject to $3x + 4y \leq 12, x \geq 0, y \geq 0$

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7. Write the maximum value of $x + y$ subject to $2x + 4y \leq 6, x \geq 0, y \geq 0.$

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8. Write the solution fo the following LPP

Maximize $z = 2x + 3y$

Subject $x + y \leq 1, x, y \geq 0.$

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9. When a linear programming problem has infinitely many solutions?

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10. When a LPP has no solution?

11. State the extreme point theorem.

12. Define objective function.

13. Two types of food X and Y re mixed to prepare a mixture is such a way that the mixture contains at least 10 units of vitamin A, 12 units of vitamin B and 8 units of vitamin X. These vitamines are avialalbe in 1kg of food as per table below. 1kg of food X costs Rs 16 and 1kg of food Y costs Rs 20. Formulate the L. P. P. so as to determine the least cost of the mixture containing the required amound of

vitamins.

Food	Vitamins		
	A	B	C
X	1	2	3
Y	2	2	1

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14. A merchant sells two models X and Y of TV with cost price ₹ 25000 and ₹ 50000 Per set respectively. He gets a profit of ₹ 1500 on model X and ₹ 2000 on model Y . The sales

connot exceed 20 sets in a month. If he cannot invest more than 6 lakh rupees, formulate the problem of determining the number of sets of each type he must keep in stock for maximum profit.

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15. Find the feasible region of the following system

$2x + y \geq 6, x - y \leq 3, x \geq 0, y \geq 0$

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16. Solve the following LPP graphically:

Maximize $z = 20x + 30y$ subject to

$3x + 5y \leq 15, x \geq 0, y \geq 0/$

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17. Minimize: $Z = 6x_1 + 7x_2$

Subject to: $x_1 + 2x_2 \geq 4$

$x_1, x_2 \geq 0$

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18. Solve the following LPP graphically

Maximize, $Z = 20x + 30y$

Subject to $3x + 5y \leq 15$

$x, y \geq 0.$

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19. Let an LPP be as follows: Maximize $Z = 3x_1 + 5x_2$ subject to $x_1 + 2x_2 \leq 12$, $2x_1 + 5x_2 \leq 20$ and $x_1, x_2 \geq 0$. Test whether

the points (2,3) and (-3,4) are feasible solutions or not.

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20. Solve the LPP Maximize $z = 5x + 3y$

Subject to $3x + 5y \leq 15$

$5x + 2y \leq 10, x \geq 0, y \geq 0$

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21. Solve the LPP Maximize $z = 5x + 3y$

Subject to $3x + 5y \leq 15$

$5x + 2y \leq 10, x \geq 0, y \geq 0$

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22. Solve the LPP Maximize $z = 3x + 2y$

Subject to $x + y \leq 400$

$2x + y \leq 500, x \geq 0, y \geq 0$

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23. A man plans to start a poultry farm by investing at most ₹ 3000. He can buy old hens for ₹80 each and young ones for ₹ 140 each, but he cannot house more than 30 hens. Old hens lay 4 eggs per week ,each ell bing sold at ₹5. It costs ₹ 5 to feed an old hen and ₹8 to feed a young hen per week. Formulate his problem determining the number of hens of each type he should buy so as to earn a proft of more than ₹ 300 per week.

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24. An agro-based company produces tomato souce and tomato jelly. The quantity of material, machine hour, labour (man hour) required to to produce one unit of each product and the avilability of raw material one given is the following table.

	souce	Jelly	availability
Man hour	3	2	10
Machinehour	1	2.5	7.5
Raw material	1	1.2	4.2

Assume that one unit of source and of unit of Jelly, yield a profit of Rs 2 and Rs 4 respectively.

Formulate the L.P.P so as to yield maximum profit.

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25. A factory uses three different respurce for the manufacture of two different products, 20 units of the resource A, 12 units of B and 16 unit of C being available. One unit of the first product requires 2,2 and 4 units of the resources and one unit of the second product requires 4,2 and 0 units of the resources taken

in order. It is known that the first product gives a profit of ₹20 per unit and the second ₹ 30 prt uniy. Formulate the LPP so as to earn maximum profit.

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26. Show that feasible region for the following constarints in a graph $2x + y \leq 4, x \geq 0 y \geq 0.$

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27. Shade the feasible region for the inequations $2x + 3y \leq 6, x \geq 0, y \geq 0$ in a rough figure.

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28. State the linear programming problem.

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29. A company has two factories at locations X and Y. He has to deliver the products from these factories to depots located at A, B and C. The production capacities at X and Y are respectively 12 and 10 units and the resquirements at the depote are 8,8 and 6 units respectively. The cost of transportation from the factories to the depote per unit of the product given below. The company has to determine how many units of product should be transported from each factory to each depot so that cost of transportation is

minimum. Formulate this problem as L. P. P.

(Cost in Rupees)

To	A	B	C
From X	210	160	250
Y	170	180	140

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30. A company produces three types of cloth A,B and C. Three kinds of wool, say red, green and blue are required for the cloth needs 2 metres of red and 3 etres of blue wool, one unit length of type B cloth needs 3 metres of

red, 2 metres of green and 2 metres of blue wool and one unit length of type C cloth needs 5 metres of green and 4 metres of blue wool. The firm has a stock of only 80 metres of red, 100 metres of green and 150 metres of blue wool. Assuming that income obtained from one unit length of cloth is ₹30, ₹50 and ₹ 40 of types . A, B and C respectively, formulate the LPP so as to maximize income.

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31. Maximize: $Z = 10x_1 + 12x_2 + 8x_3$

Subject to: $x_1 + 2x_2 \leq 30$

$5x_1 - 7x_3 \geq 12$

$x_1 + x_2 + x_3 = 20$

$x_1, x_2 \geq 0$

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32. Maximize $z = -10x + 2y$

Subject to

$-x + y \geq -1, x + y \leq 6, y \leq 5, x, y \geq 0$

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33. Solve the following LPP graphically :

Maximize : $Z = 5x_1 + 3x_2$ subject to :

$3x_1 + 5x_2 \leq 15\ 5x_1 + 2x_2 \leq 10\ x_1, x_2 \geq 0$

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34. Solve the following LPP graphically:

Maximize: $Z = 4x_1 + 3x_2$ subject to

$x_1 + x_2 \leq 50, x_1 + 2x_2 \leq 80, 2x_1 + x_2 \geq 20,$

$x_1, x_2 \geq 0$

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35. Solve the following LPP graphically

Maximize $z = 20x + 10y$

Subject to $x + 2y \leq 40$

$3x + y \geq 30$

$4x + 3y \geq 60$

$x, y \geq 0$

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36. Solve the following LPP graphically

Maximize $z = 20x_1 + 10x_2$

Subject to $x_1 + 2x_2 \leq 40$

$3x_1 + x_2 \geq 30$

$4x_1 + 3x_2 \geq 60$

$x_1, x_2 \geq 0$

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37. Solve the following LPP graphically

Maximize $z = 5x_1 + 3x_2$

Subject to

$$3x_1 + 5x_2 \leq 15, 5x_1 + 2x_2 \leq 10, x_1, x_2 \geq 0.$$

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