MATHS

NCERT - NCERT MATHEMATICS(TELUGU)

LINEAR PROGRAMMING

Example Type

1. Solve the following linear programming problem graphically:

Maximise $Z = 4x + y$ 1

subject to the constraints:

$x + y \leq 50$ 2

$3x + y \leq 90$.....3

$x \geq 0, y \geq 0$.....4

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2. Solve the following linear programming problem graphically:

Minimise $Z = 200x + 500y$.....1

subject to the constraints:

$x + 2y \geq 10$.....2

$3x + 4y \leq 24$.....3

$x \geq 0, y \geq 0$.....4

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3. Solve the following problem graphically.

Minimise and Maximise $Z = 3x + 9y$.....1

subject to the constraints $x + 3y \leq 60$.....2

$x + y \geq 10$.....3

$x \leq y$.....4

$x \geq 0, y \geq 0$.....5

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4. Minimise $Z = 3x + 2y$

subject to the constraints,

$x + y \geq 8$.....1

$3x + 5y \leq 15$.....2

$x \geq 0, y \geq 0$.....3

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5. (Diet Problem): A dietician wishes to mix two types of foods in such a way that vitamin

contents of the mixture contain atleast 8 units of vitamin A and 10 units of vitamins C. Food I contains 2 units/ kg of vitamins A and 1 unit/kg of vitamin C. Food II contains 1 unit/kg of vitamin A and 2 units/kg of vitamine C. It costs Rs. 50 per kg to purchase Food I Rs. 70 per kg to purchase Food II. Formulate this problem as a linear programming problem to minimise the cost of such a mixture.

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6. (Allocation problem) A cooperative society of farmers has 50 hectare of land to grow two crops X and Y. The profit from crops X and Y per hectare are estimated as rs. 10,500 and Rs. 9,000 respectively. To control weeds, a liquid herbicide has to be used for crops X and Y at rates of 20 litres and 10 litres pre hectare. Further, no more than 800 litres of herbicide should be used in order to protect fish and wild life using a pond which collects drainage from this land. How much land should be

allocated to each crop so as to maximise the total profit of the society?

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7. (Manufacturing problem): A manufacturing company makes two models A and B of a product. Each piece of Model A requires 9 labours for fabricating and 1 labour hour for finishing. Each piece of Model B requires 12 labour hours for fabricating and 3 labour hours for finishing. For fabricating and

finishing the maximum labour hors available are 180 and 30 respectively. The company makes a profit of Rs. 8000 on each piece of model Aand Rs. 12000 on each piece of Model B. How many piecesof Model A and Model B should be manufactured per week to realise a maximum profit? What is the maximum profit per week?

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Miscellaneous Examples

1. (Diet problem): A dietician has to develop a special diet using two foods P and Q. Each packet (containing 30 g) of food P contains 12 units oif calcium, 4 units iof iron, 6 units of cholesteroa and 6 units of vitamiin A. Each packet of the same quantity of food Q contains 3 units of calcium, 20 units of iron, 4 units of cholesterol and 3 units of vitamin A. The diet requires atleast 240 units of calcium, atleast 460 units of iron and at most 300 units of cholestero. How many packets of each food should be used to minimise the maount of

vitamin A in the diet? What is the minimum amount of vitamin A?

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2. (Manufacturing problem): A manufacturer has three machines. I, II and III installed in his factory. Machines I and II are capable of being operated for at most 12 hours whereas machine III must be operated for atleast 5 hours a day. She produces only two items M and N each requiring the sue of all the three

machines.

The number of hours required for producing 1 unit of each of M and N on the three machies are given in the followig table:

Items	Number of hours required on machines		
	I	II	III
M	1	2	1
N	2	1	1.25

She makes a profit of Rs. 600 and Rs. 400 on items M and N respectively. How many of each item should be produce so as to maximise her profit assuming that she can sell all the items that she produced? What will be the maximum profit?

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3. (Transportaion problem) : There are two factories located one at place P and the other at place Q. From these locations, a certain commodity is to be delivered to each of the three depots situated at A,B and C. The weekly requirements of the depots are respectively 5,5 and 4 units of the commodity while the production capacity of the factories at P and Q are respectively 8 and 6 units. The cost of transportaion per unit is given below:

From/To	Cost (in Rs)		
	A	B	C
P	160	100	150
Q	100	120	100

How many units should be transported from each factory to each depot in order that the transportation cost its minimum. What will be the minimum transportation cost?

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Exercise 12 1 Solve The Following Linear Programming Problems Graphically

1. Maximise $Z = 3x + 4y$

Subject to the constraints

$x + y \leq 4, x \geq 0, y \geq 0$

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2. Minimise $Z = -3x + 4y$

subject to

$x + 2y \leq 8, 3x + 2y \leq 12, x \geq 0, y \geq 0$

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3. Maximise $Z = 5x + 3y$

subject to

$3x + 5y \leq 15, 5x + 2y \leq 10, x \geq 0, y \geq 0$

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4. Minimise $Z = x + 2y$

subject to $2x + y \geq 3, x + 2y \geq 6, x, y \geq 0$

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5. Maximise $Z = 3x + 2y$

subject to

$x + 2y \leq 10, 3x + y \leq 15, x, y \geq 0$

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6. Maximise $Z = 3x + 2y$

subject to

$x + 2y \leq 10, 3x + y \leq 15, x, y \geq 0$

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