MATHS

BOOKS - OMEGA PUBLICATION

LINEAR PROGRAMMING

Question

1. Maximise $z = 4x + y$

$x + y \leq 50$

$3x + y \leq 90$

$x \geq 0$

$y \geq 0$

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2. Maximise $z = 3x + 9y$

Subject to he constraints

Maximise $z = 3x + 9y$

Subject to he constraints

$x + y \leq 60$

$x + y \geq 10$

$x \leq y$

$x \geq 0, y \geq 0$

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3. Find the equation of the plane which contains the line of intersection of the planes $\vec{r} \cdot \left(\hat{i} + 2\hat{j} + 3\hat{k}\right) - 4 = 0, \vec{r} \cdot \left(2\hat{i} + \hat{j} - \hat{k}\right) + 5 = 0$ and which is perpendicular to the plane $\vec{r} \cdot \left(5\hat{i} + 3\hat{j} - 6\hat{k}\right) + 8 = 0$

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4. Solve the following linear programming problem graphically : Minimize $Z = -3x + 4y$ subject to constraints $x + 2y \leq 8, 3x + 2y \leq 12, x \geq 0, y \geq 0.$

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5. Solve the following linear programing problems graphically :

Maximize $Z = 3x + 4y$

subject to the constraints

$x + y \leq 4,$

$x \geq 0,$

$y \geq 0.$

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

subject to the constraints

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

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7. Solve the following linear programing problems graphically :

Minimise $Z = 3x + 5y$

Subject to the constraints :

$x + 2y \geq 3,$

$x + y \geq 2,$

$x \geq 0, \geq 0.$

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8. Maximize $z = 5x + 10y$

Subject to constraints

$x + 2y \leq 120$

$x + y \geq 60$

$x - 2y \geq 60$

$x - 2y \geq 0$

$x, y \geq 0$ Graphically.

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9. Solve the following Linear Programming Problem graphically : Minimize $Z = x + 2y$ subject to the constraints : $2x + y \geq 3, x + 2y \geq 6, x, y \geq 0.$

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10. A factory makes tennis rackets and cricket bats. A tennis racket takes 1.5 hours of machine time and 3 hours of craftman's time in its making while a cricket bat takes 3 hour of machine time and 1 hour of craftman's time. In a day, the factory has the availability of not more than 42 hours of machine time and 24 hours of craftsman's time. What number of rackets and bats must be made if the factory is to work at full capacity?

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11. A dietician wishes to mix two types of food in such a way that the vitamin contents of the mixture contains atleast 8 units of vitamin A and 10 units of vitamin C. Food I contains two units/kg of vitamin A and one unit /kg of vitamin C while Food II contains 1 unit/kg of vitamin A and 2 units/kg of vitamin C. It cost Rs 5 per kg to purchase Food I and Rs 7 per kg to purchase food II. Formulate the problem for minimum of such a mixture. Formulate tha above as a LPP and solve it graphically.

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12. A merchant planes to sell two types of personal computers -a desktop model and a portain model that will cost Rs. 2500 and Rs. 40000 respectively. He estimates that the total montain demand of computers will not exceed 250 units. Determine the number of units of easy type of computers which the merchant should stock to get maximum profit it he does want to invest more than Rs. 70 lakhs and if his profit on the desktop model is Rs. 4500 on portable model is Rs. 5000. Make an L.P.P and solve it graphically.

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13. Maximise $z = 4x + y$

$x + y \leq 50$

$3x + y \leq 90$

$x \geq 0$

$y \geq 0$

Watch Video Solution

14. Maximise $z = 3x + 9y$

Subject to he constraints

Maximise $z = 3x + 9y$

Subject to he constraints

$x + y \leq 60$

$x + y \geq 10$

$x \leq y$

$x \geq 0, y \geq 0$

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15. Find the equation of the plane which contains the line of intersection of the planes $\vec{r} \cdot \left(\hat{i} + 2\hat{j} + 3\hat{k}\right) - 4 = 0, \vec{r} \cdot \left(2\hat{i} + \hat{j} - \hat{k}\right) + 5 = 0$ and which is perpendicular to the plane $\vec{r} \cdot \left(5\hat{i} + 3\hat{j} - 6\hat{k}\right) + 8 = 0$

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16. Solve the following linear programming problem graphically : Minimize $Z = -3x + 4y$ subject to constraints $x + 2y \leq 8, 3x + 2y \leq 12, x \geq 0, y \geq 0.$

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17. Solve the following linear programing problems graphically :

Maximize $Z = 3x + 4y$

subject to the constraints

$x + y \leq 4,$

$x \geq 0,$

$y \geq 0.$

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

subject to the constraints

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

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19. Solve the following linear programing problems graphically :

Minimise $Z = 3x + 5y$

Subject to the constraints :

$x + 2y \geq 3,$

$x + y \geq 2,$

$x \geq 0, \ \geq 0.$

Watch Video Solution

20. Maximize $z = 5x + 10y$

Subject to constraints

$x + 2y \leq 120$

$x + y \geq 60$

$x - 2y \geq 60$

$x - 2y \geq 0$

$x, y \geq 0$ Graphically.

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21. Solve the following Linear Programming Problem graphically : Minimize $Z = x + 2y$ subject to the constraints : $2x + y \geq 3, x + 2y \geq 6, x, y \geq 0.$

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22. A machine takes 20 hours in cutting 720 tools.How many tools will it cut in 80 hours.

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23. A dietician wishes to mix two types of food in such a way that the vitamin contents of the mixture

contains atleast 8 units of vitamin A and 10 units of vitamin C. Food I contains two units/kg of vitamin A and one unit /kg of vitamin C while Food II contains 1 unit/kg of vitamin A and 2 units/kg of vitamin C. It cost Rs 5 per kg to purchase Food I and Rs 7 per kg to purchase food II. Formulate the problem for minimum of such a mixture. Formulate tha above as a LPP and solve it graphically.

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24. A merchant planes to sell two types of personal computers -a desktop model and a portain model that will cost Rs. 2500 and Rs. 40000 respectively. He

estimates that the total montain demand of computers will not exceed 250 units. Determine the number of units of easy type of computers which the merchant should stock to get maximum profit it he does want to invest more than Rs. 70 lakhs and if his profit on the desktop model is Rs. 4500 on portable model is Rs. 5000. Make an L.P.P and solve it graphically.

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Question Miscellaneous Exercise

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 of calcium, 4 units of iron, 6 units of cholesterol and 6 units of vitamin 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 cholesterol. How many packets of each food should be used to minimise the amount of vitamin A in the diet? What is the minimum amount of vitamin A?

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2. What is the value of sin A .

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3. An aeroplane can carry maximum of 200 passengers, A profit of ₹ 400 is made on each first class ticket and a profit of ₹ 300 is made in each second class ticket. The airline reserves at least 20 seates for first class. However, at least four times as many passengers prefer to travel by second class than first class. Determine how many tickets of each type must be sold to maximise profit for the airline. Form an L.P.P. and solve it graphically.

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4. A dealer in rural area wishes to purchase a number of sewing machines. He has only Rs 5670 to invest and has a space for at most 20 items. An electronic sewing machine costs him Rs 360 and manually operated sewing machine Rs 240. He can sell electronic sewing machine at a profit of Rs 22 and a manually operated sewing machine at a profit of Rs 18. Assumning that he can sell all the items that he can buy, how should he invest his money in order to maximize his profit. Make it a linear programming problem and solve it graphically. Keeping the rural background in mind

justify the values to be promoted for the selection of the manually operated machine.

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5. (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 of calcium, 4 units of iron, 6 units of cholesterol and 6 units of vitamin 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 cholesterol. How many

packets of each food should be used to minimise the amount of vitamin A in the diet? What is the minimum amount of vitamin A?

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6. Are sets $A = \{-2, 2\}$, $B = \{x : x \in Z, |x| - 2 = 0\}$ equal? Why?

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7. An aeroplane can carry maximum of 200 passengers, A profit of ₹ 400 is made on each first class ticket and a profit of ₹ 300 is made in each

second class ticket. The airline reserves at least 20 seates for first class. However, at least four times as many passengers prefer to travel by second class than first class. Determine how many tickets of each type must be sold to maximise profit for the airline. Form an L.P.P. and solve it graphically.

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