

Industrial Applications of Mathematical

Sub Code: 15CMA5D

Question Bank

Unit-I

Section-A (10X2=20 Marks)

1. Define Operation Research?
2. What is meant by Operation Research?
3. What is the scope of Operation Research?
4. What are the applications of Operation Research?
5. List of uses of Operation Research?
6. What are the differential phases of Operation Research?
7. What are the Characteristics of an Operation Research Problem?
8. What is a Model?
9. What is a Mathematical Model?
10. What are the different types of Model?
11. What are the Characteristics of a good Model?
12. What are the limitations of a Mathematical Model?

13. What are the limitations of an Operation Research Model?
14. State the different types of Models used in Operation Research?
15. What are the various phases in the study of Operation Research?
16. Name the models used in Operation Research?
17. List of the Characteristics of linear programming problem?
18. How will you identify the unbounded solution from simplex table?
19. Define Basic solution of a LPP?
20. Write two major areas of applications of Operation Research?
21. What do you mean by a general LPP?
22. Define feasible region?
23. Define redundant constraint?
24. When we say that an LPP have
 - (I) Unique Solution

- (II) Unbounded Solution
- (III) An infinite number of Solutions
- (IV) No solution

- 25. What do you understand by the term constraint?
- 26. When we can use the graphical method for solving a LPP?
- 27. State the limitations of the graphical method of solving a LPP?
- 28. What are the assumptions underlying Linear Programming?
- 29. What does the non-negativity restriction mean?
- 30. What are the applications of linear Programming?
- 31. Name any two major requirements of a LPP?
- 32. List the limitations of LPP?
- 33. What is the Characteristic of Linear Programming?
- 34. State any three salient features of a LPP?
- 35. Define feasible solution?
- 36. Define Optimal Solution?
- 37. Define Infeasible Solution?
- 38. Define Slack variables?

39. Define Surplus variables?
40. Define unrestricted variables?
41. What do you mean by Canonical form of a LPP?
42. What do you mean by Standard form of a LPP?
43. Write the standard form of LPP in matrix form?
44. Write the Canonical form of LPP in matrix form?
45. State the Characteristic of the Standard form?
46. Express the following LPP in Standard form $\text{Min } 2x_1 + 3x_2$
subject to $x_1 + x_2 \leq 5$, $3x_1 - 2x_2 \geq 5$, $x_1 + 2x_2 = 3$, $x_1, x_2 \geq 0$
47. What do you mean by basic and non-basic variable?
48. Write the Mathematical model of LPP?
49. What is meant by Optimality test?
50. What is meant by degeneracy of a LPP?

Section-B (5X5=25)

1. Explain the general methods of solving Operation Research models?

2. Explain the term feasible solution with an example.
3. Write a short-note on the role of Operation Research?
4. Mathematical formulation of LPP?
5. Formulate the LPP?
6. Solve the Problem graphically?
 - (I) Max $Z=3x_1+2x_2$ subject to $x_1 \leq 2$, $x_1+x_2 \leq 3$, $2x_1+x_2 \leq 1$,
 $x_1, x_2 \geq 0$
 - (II) Max $Z=x_1-2x_2$ subject to $-x_1+x_2 \leq 1$, $6x_1+4x_2 \geq 24$,
 $0 \leq x_1 \leq 5$ & $2 \leq x_2 \leq 4$.
7. Express the following LPP in standard form
 Max $Z=4x_1+2x_2+6x_3$, subject to $2x_1+3x_2+2x_3 \geq 6$, $3x_1+4x_2=8$,
 $6x_1-4x_2+x_3 \leq 10$, $x_1, x_2 \geq 0$, x_3 an restricted.
8. Explain the Graphical method of solving LPP?

Section-C (3X10=30)

1. Explain Simplex Algorithm
2. Solve by Graphical Method

Max $Z \geq 6000x_1 + 4000x_2$, subject to $x_1 \leq 120$, $x_2 \leq 150$,
 $10x_1 + 8x_2 \leq 1600$, $x_1, x_2 \geq 0$.

3. Solve by Simplex method

Max $Z \geq 4x_1 + 10x_2$, subject to $2x_1 + x_2 \leq 50$, $2x_1 + x_2 \leq 50$,
 $2x_1 + 5x_2 \leq 100$, $2x_1 + 3x_2 \leq 90$, $x_1, x_2 \geq 0$

Unit-II

Section-A (10X2=20)

1. What do you mean by Big M-Method?
2. Why the artificial variables are called so?
3. What is the use of artificial variables?
4. What is the purpose of artificial variable?
5. What is a dual problem in linear programming?
6. What do you mean by primal-dual problems?
7. What is the duality in LPP?
8. State the importance of the duality concept in LPP?
9. State the fundamental theorem of duality?
10. State the existence theorem of duality?

11. State the necessary and sufficient condition for any LPP?
12. State the complementary slackness theorem of duality?
13. How do you convert the dual into primal?
14. Write down the dual of the following LPP

$$\text{Max } Z = 5x_1 + 12x_2 + 4x_3 \text{ subject to } x_1 + 2x_2 + x_3 \leq 5, \quad 2x_1 - x_2 + 3x_3 \leq 2, \quad 2x_1 + 4x_2 + 3x_3 \geq 2, \quad x_1, x_2, x_3 \geq 0.$$

15. State the primal-dual relationship?

Section-B (5X5=25)

1. Explain the importance of duality in LPP?
2. Explain primal-dual relations?
3. Differentiate between primal problem and dual problem?
4. Solve by Big -M-Method Max $Z = 3x_1 + 2x_2$ subject to $x_1 + 3x_2 \leq 5, 3x_1 + 4x_2 \geq 3, x_1, x_2 \geq 0$.
5. Write the dual of the following LPP

$$\text{Min } Z = 3x_1 + 2x_2 + 3x_3 \text{ subject to } x_1 + x_2 + x_3 = 4, \quad 3x_1 + 2x_2 - x_3 \leq 5, \quad x_1 + x_2 + x_3 \geq 3, \quad x_1, x_2 \geq 0, \quad x_3 \text{ is unrestricted.}$$

Section-c

1. Solve by Big-m-method $\max z = x_1 + 2x_2 + 3x_3 - x_4$ sol.to
 $x_1 + 2x_2 + 3x_3 \leq 15$, $2x_1 + x_2 + 5x_3 \geq 20$, $x_1 + 2x_2 + x_3 + x_4 = 10$, $x_1, x_2, x_3, x_4 \geq 0$.
2. Explain Big-m-method.
3. Use penalty method to solve following LPP:

$$\text{Max } z = 4x_1 + 3x_2 \text{ subject to } 2x_1 + x_2 \geq 10$$

$$-3x_1 + 2x_2 \leq 6, x_1 + x_2 \geq 6, x_1, x_2 \geq 0.$$

UNIT-3

Section-A

1. write the mathematical formulation of T.P
2. state the necessary and sufficient condition for the existence
to feasible solution to a T.P.
3. Define degenerate and non-degenerate basic feasible
Solution of a transportation problem.
4. what is balance transportation problem?
5. write the method to find an initial basic feasible.
6. Define –feasible solution , Basic feasible solution ,
Degenerate basic feasible solution, non-degenerate basic
Feasible solution and optimal solution of a transportation

Problem.

7. what do you mean by balance and unbalanced T.P .Explain

How would you convert the unbalanced problem into a
Balanced one?

8. Describe the method of solving unbalanced T.P.

9. Define unbalanced T.P.

10. How to test the optimal condition in T.P.

Section-B

1. Determine an IBFS by i) NUC ii) LCM iii)VAM

10	13	6	10
16	7	13	12
8	22	2	8

2. Explain in brief with examples

i)North west corner rule (NWC)

ii)Least cost method (LCM)

iii)vogals approximation method (VAM)

3. Describe the method of solving unbalanced T.P

4. Describe a transportation problem and give a method of finding an initial feasible solution.
5. Explain an algorithm for solving a transportation problem.

Section-c

1. solve the following transportation problem

50	30	10	1
20	10	4	3
30	20	40	4
4	2	2	

2. obtain an optimum basic feasible solution to the following T.P

2	2	3	10
4	1	2	15
1	3	1	40
20	15	30	

3. Find the minimum cost of transportation ,given

5	1	7	10
6	4	6	80
3	2	5	15
75	20	50	

UNIT-4

Section-A

- 1.what are assignment problem?
- 2.Describe the mathematical formulation of an assignment Problem .
- 3.Define an unbalanced assignment problem.
- 4.Describe the mathematical formulation of an assignment Problem.
- 5.solve the assignment problem

$$\begin{pmatrix} 1 & 4 & 6 & 3 \\ 9 & 7 & 10 & 9 \\ 4 & 5 & 11 & 7 \\ 8 & 7 & 8 & 5 \end{pmatrix}$$

- 6.Explain Hungarian method.

Section-c

- 1.Explain the steps in the Hungarian method used for solving Assignment problem.

- 2.solve the assignment problem

$$\begin{pmatrix} 18 & 26 & 17 & 11 \\ 13 & 28 & 14 & 26 \\ 38 & 19 & 18 & 15 \\ 19 & 26 & 24 & 10 \end{pmatrix}$$

3. Describe mathematical formulation of assignment problem.

UNIT-5

Section-A

1. Define an Inventory

2. What are the uses of Inventory

3. Write the types of Inventory

4. Define purchase cost, ordering cost, carrying cost, shortage Cost, Total Inventory cost, lead time.

5. What are the assumptions in Inventory.

6. Write the formula for purchasing model with no shortages.

7. Write the formula for manufacturing model with no shortages

Section-B

1. For an item the production is instantaneous. The storage cost of one item is Rs.1 per month and the setup cost is Rs.25 per run. If the demand is 200 units per month. Find the optimum quantity to be produced per setup.

2. A company uses annually 4800 units of a raw material costing

Rs.1.2 per unit .placing each order cost is Rs.45 and the carrying cost is 15% per year of the average Inventory .Find EOQ

3.A cycle factory consumes per year 6000kg of a rubber costing Rs.5 per kg .placing each order cost Rs.25 and the carrying Cost is 6 percent per year .Find the EOQ & the total Inventory Cost , when the demand rate is 200kg.

Section-C

- 1.Explain the method of purchasing model with no shortages
- 2.Explain the method of manufacturing model with no shortage
- 3.problems based Q .No (1)
- 4.problems based on Q .No(2)
- 5.A contractor has to supply 20,000 units per day .He can Produce 30,000 units per day .The cost of holding a unit in Stock is Rs.3 per day setup cost is Rs.50 .Find EOQ.