

31/10/23
VCD

Statistics-III

SY-BSc. (MS) SEM-III Operation Research HRS- 3 MARKS-100

Note: (i) All questions are compulsory.
(ii) Use of Calculator is allowed.

Q.1) Answer the following questions

a) State True or False, Correct if necessary:

(10M)

- Every LPP has an optimal solution.
- If the objective function line is parallel to one of the constraints, then solution is unbounded.
- It is easier to solve transportation problems using LPP.
- There is always a unique solution for transportation problems.
- every sequencing problem must have a unique optimal solution.

b) Answer in One sentence:

(10M)

- Define feasible solutions.
- Define basic feasible solutions.
- What is the sequencing problem?
- State any two assumptions sequencing problem.
- Which method gives initial basic feasible solutions.

Q.2) Attempt any TWO

(20M)

a) Use Graphical method to solve following LPP.

$$\text{Max } Z = 2x_1 + 3x_2$$

Subject to constraints $x_1 + x_2 \leq 30$, $x_2 \geq 3$, $x_2 \leq 12$, $x_1 - x_2 \geq 0$, $x_1 \leq 20$, $x_1 \geq 0$, $x_2 \geq 0$

b) Generalize representation of general LPP for optimizing operation problem.

c) Prove that Dual of Dual is primal. Using mathematical notations.

Q.3) Attempt any TWO

(20M)

a) Find initial feasible solution by VAM (Vogel Approximation Method)

| Source | Warehouses | | | | Availability |
|--------------|------------|----|----|----|--------------|
| | W1 | W2 | W3 | W4 | |
| S1 | 6 | 2 | 4 | 4 | 38 |
| S2 | 4 | 4 | 6 | 5 | 19 |
| S3 | 7 | 5 | 5 | 4 | 16 |
| S4 | 5 | 0 | 5 | 3 | 23 |
| Requirements | 25 | 29 | 21 | 21 | 96 |

- How will you resolve the following difficulties in transportation problem technique.
- Problem is of maximization ii) Problem is unbalanced.
- Compare solutions of all initial basic feasible solutions.

Q.4) Attempt any TWO

a) A construction company has requested date for subcontracts on five different projects. Five companies have responded. There bids are represented below.

| Bidders | I | II | III | IV | V |
|---------|----|----|-----|----|----|
| 1 | 47 | 32 | 67 | 42 | 57 |
| 2 | 52 | 32 | 27 | 62 | 32 |
| 3 | 27 | 22 | 17 | 22 | 42 |
| 4 | 37 | 27 | 32 | 32 | 22 |
| 5 | 82 | 62 | 62 | 72 | 52 |

Determine the minimum cost assignment of subcontracts to bidders, assuming that each bidder can receive only one contract at a time.

b) i) Explain briefly Travelling Salesman Problem

ii) A Salesman has to visit four cities A,B,C and D, The distance (in 100 miles) between the four cities are as follows.

| | A | B | C | D |
|---|----------|----------|----------|----------|
| A | ∞ | 5 | 8 | 4 |
| B | 5 | ∞ | 7 | 4 |
| C | 8 | 7 | ∞ | 8 |
| D | 4 | 4 | 8 | ∞ |

If the Salesman starts from city A and has to come back to city A. Find the route he should select so the total distance is minimum.

c) i) Write algorithm of Hungarian method. ii) Write advantages of Hungarian Method

Q.5) Attempt any TWO

(20M)

a) Generalize Process for solving LPP by Big M method. Give advantages of Big M method.

b) Write algorithm for MODI method for checking optimality of transportation problem. Give advantages of using MODI method.

c) A company has four machines that are used for three jobs. Each job can be assigned to one and only one machine. The cost (in 100' Rs) of each job on each machine is given in the following table.

| | I | II | III | IV |
|---|----|----|-----|----|
| A | 20 | 26 | 30 | 34 |
| B | 10 | 15 | 19 | 20 |
| B | 12 | 17 | 21 | 24 |

What is job assignment pair that shall minimize the cost?