VCD131022

VCD/ SYBSC- SEM III STATISTICS – III 100 MARKS 3HRS Extra

**Note:** (i) All questions are compulsory.
(ii) Figures to the right indicate marks for respective questions.

Q.1) Attempt all sub questions. [20]

a) State true of false and correct if necessary. 10

i) Constraints are the entities whose values are to be determined from the solution of the LPP

ii) The variable added to the LHS of a less than or equal to constraint to convert it into equality is called slack variable.

iii) MODI Method is used to test optimality of the solution.

iv) The Hungarian method is used to obtain optimum solution of transportation problem.

v) If there are n workers and n jobs, there will be n! Solutions.

b) Answer the following. 10

i) If there are 5 variables in 3 equations and the solution set is $X = \{0,0,1,1,2\}$

Then, comment on the solution.

ii) Define Closed Path.

iii) How to calculate opportunity loss matrix?

iv) How to convert assignment problem of maximization to minimization?

v) Define an unbalanced assignment problem.

Q.2) Attempt any two sub-questions. [20]

a) Define LPP and explain its general structure. 10

b) Use graphical method to Minimize, $Z = 2x_1 + 3x_2$ Subject to constraints,
$x_1 + x_2 \leq 30$, $x_2 \geq 6$, $x_2 \leq 12$, $x_1 - x_2 \geq 0$,
where, $x_1 \geq 0$ and $x_2 \geq 0$ 10

c) Solve LPP using simplex method, Maximize $Z = 5x_1 + 7x_2$ subject to constraint,
$x_1 + x_2 \leq 4$, $3x_1 - 8x_2 \leq 24$, $10x_1 + 7x_2 \leq 35$, Where, $x_1 \geq 0$, $x_2 \geq 0$ 10

Q.3) Attempt any two sub-questions. [20]

a) Explain briefly Matrix Minima Method. Obtain the initial basic feasible solution to the following transportation problem using the matrix minima method. 10

| | D1 | D2 | D3 | D4 | Availability |
|---|---|---|---|---|---|
| O1 | 1 | 2 | 3 | 4 | 6 |
| O2 | 4 | 3 | 2 | 0 | 8 |
| O3 | 0 | 2 | 2 | 1 | 10 |
| Requirement | 4 | 6 | 8 | 6 | |

b) How will you resolve following difficulties in transportation problem technique.
i) Problem is of maximization ii. Problem is unbalanced 10

c) What is Prohibited Routes? The following transportation table shows the transportation cost per unit in Rs. from sources 1, 2 and 3 to destination A, B and C. Shipment of goods is prohibited from source 2 to destination C. Solve the transportation problem. 10

| | A | B | C | Supply |
|---|---|---|---|---|
| 1 | 20 | 16 | 14 | 120 |
| 2 | 10 | 2 | --- | 150 |
| 3 | 5 | 7 | 11 | 180 |
| Demand | 150 | 125 | 75 | |

Q.4) Attempt any two sub-questions. [20]

a) Explain briefly Traveling salesman problem. 10

A salesman has to visit five cities A, B, C, D & E. Starting from city A, he has to come back to same city A visiting all cities only once. The distances in 100 Km between five cities are given below.

| | A | B | C | D | E |
|---|---|---|---|---|---|
| A | ∞ | 16 | 21 | 23 | 19 |
| B | 22 | ∞ | 23 | 20 | 21 |
| C | 21 | 23 | ∞ | 24 | 22 |
| D | 23 | 20 | 24 | ∞ | 23 |
| E | 19 | 21 | 22 | 23 | ∞ |

Which root the salesman should select so that the total distance covered is minimum.

b) There are five workers available to do five different jobs. The time in hours each worker requires to complete each of these five jobs are given below. Obtain assignments of worker to job so that total time required to complete all jobs is minimum. 10

| | I | II | III | IV | V |
|---|---|---|---|---|---|
| A | 20 | 8 | 4 | 6 | 3 |
| B | 25 | 21 | 24 | 8 | 10 |
| C | 9 | 12 | 10 | 19 | 24 |
| D | 11 | 6 | 15 | 24 | 19 |
| E | 14 | 13 | 19 | 10 | 4 |

c) How will you solve assignment problem using Hungarian method. 10

Q.5) Attempt any two sub-questions. [20]

a) i) Write the dual to the following LPP. Min $Z = 2x_1 - 3x_2$, subject to, 05

$5x_1 + x_2 \leq 6$, $-4x_2 + 2x_3 \geq 5$, $x_1 \leq 6$, Where, $x_1 \geq 0$, $x_2 \geq 0$

ii) Define: a) solution b) Feasible solution. c) Feasible region. d) Optimal solution. e) Infeasible solution. 05

b) i) What do you understand by transportation model? 05

ii) Solve the following transportation problem. 05

| | W1 | W2 | W3 | Supply |
|---|---|---|---|---|
| O1 | 4 | 2 | 8 | 20 |
| O2 | 12 | 6 | 4 | 30 |
| O3 | 16 | 14 | 15 | 17 |
| Demand | 24 | 30 | 28 | |

c) i) How to solve unbalanced assignment problem. 05

ii) Solve the maximization assignment problem for the following data. 05

| | I | II | III | IV |
|---|---|---|---|---|
| A | 15 | 13 | 12 | 18 |
| B | 17 | 19 | 12 | 16 |
| C | 16 | 14 | 15 | 17 |
| D | 15 | 17 | 17 | 18 |

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