

[21]

Sardar Patel University
S.Y.B.Sc.(Semester-III) Examination
Subject:-Operation Research-I
Paper Code:-US03ESTA01

Date:-02/01/2021,Saturday

Time:-10:00 a.m. to 12:00 p.m.

Marks:-70

Q.1. Multiple Choice Questions: -

[10]

- 1 In graphical method of linear programming problem if the iso-profit line coincide with a side of region of basic feasible solutions we get _____.
a) Unique optimum solution b) unbounded optimum solution c) no feasible solution d) Infinite no. of optimum solutions
- 2 Minimization of objective function in LPP means _____.
a) Value occurs at allowable decision b) highest value is chosen among allowable decision c) none of the above d) all of the above
- 3 A feasible solution of LPP _____.
a) Must satisfy all the constraints simultaneously b) Need not satisfy all the constraints, only some of them c) Must be a corner point of the feasible region d) all of the above
- 4 For a minimization problem, the objective function coefficient for an artificial variable is _____.
a) + M b) -M c) Zero d) None of these
- 5 For minimization LPP, the simplex method is terminated when all values _____.
a) $z_j - c_j \leq 0$ b) $z_j - c_j \geq 0$ c) $z_j - c_j = 0$ d) $z_j \leq 0$
- 6 If any value in x_b - column of final simplex table is negative, then the solution is _____.
a) unbounded b) infeasible c) optimal d) None of these
- 7 The initial solution of a transportation problem can be obtained by applying any known method. The only condition is that _____.
a) the solution be optimal b) the rim condition are satisfied. c) the solution not be degenerate. d) all of the above.
- 8 The dummy source or destination in a transportation problem is added to _____.
a) satisfy rim condition. b) prevent solution from becoming degenerate. c) ensure that total cost does not exceed a limit. d) all of the above.
- 9 An alternative optimal solution to a minimization transportation problem exists whenever opportunity cost corresponding to unused routes of transportation is _____.
a) positive and greater than zero. b) positive with at least one equal to zero. c) negative with at least one equal to zero. d) all of the above.
- 10 One disadvantage of using North-West Corner Rule to find initial solution to the transportation problem is that _____.

- a) it is complicated to use. b) it does not take into account cost of transportation. c) it leads to degenerate initial solution d) all of the above.

Q.2. Fill in the blanks: -

[08]

- 1 For solving LPP, graphical method is applied for only _____ variables.
- 2 If $x_1 = 3$ and $x_2 = 5$ then $\text{Max } z = 30x_1 + 60x_2$ is _____.
- 3 If in LPP has n constraints and n variable then dual problem have ___ constraints and ___ variable.
- 4 Every Primal problem has _____ problem.
State whether following are True or False.
- 5 If in transportation problem have m origin and n destination then the total number of allocation is $m+n-2$.
- 6 In North west corner method the first allocation is cell (2,2).
- 7 For the unoccupied cell $c_{ij} = a_i + v_j$.
- 8 If Row is greater than column in T.P. then we have to add row for solving T.P.

Q.3. Short Questions: - (Attempt any Ten)

[20]

- 1 Write the steps for converting a linear programming problem to canonical form.
- 2 How will you plot inequalities of a LPP?
- 3 Define iso-profit and iso-cost lines. How do these help to obtain a solution to an LPP?
- 4 Define the slack variable and surplus variable giving illustration.
- 5 What is the Artificial variable?
- 6 Write steps of writing dual of a LPP.
- 7 What is Transportation problem?
- 8 State the mathematical steps for solving T.P.
- 9 Write the steps for solving Initial basic feasible solution for Transportation Problem.
- 10 What is Degeneracy in T.P.?
- 11 What is Unbalanced T.P.?
- 12 Write steps for solving T.P. by Least Cost method.

Q.4. Long Questions: - (Attempt any four)

[32]

- 1 A firm manufactures Headache pills in two sizes A and B. Size A contains 2 grains of aspirin, 5 grains of bicarbonate and 1 grain of codeine. Size B contains 1 grain of aspirin, 8 grains of bicarbonate and 6 grains of codeine for providing immediate effect. It is required to determine the least number of pills a patient should take to get immediate relief. Formulate the problem.

- 2 Solve the following LP problems graphically

$$\begin{aligned} \text{Maximize } Z &= 30x_1 + 20x_2 \\ \text{s.t. } 3x_1 + 3x_2 &\geq 40 \\ 3x_1 + x_2 &\geq 40 \\ 2x_1 + 5x_2 &\geq 44 \\ x_1, x_2 &\geq 0 \end{aligned}$$

- 3 Solve the given problem by Simplex method.

$$\begin{aligned} \text{Max } z &= 50x_1 + 100x_2 \\ \text{s.t. } 10x_1 + 5x_2 &\leq 250 \end{aligned}$$

$$4x_1 + 10x_2 \leq 200$$

$$x_1, x_2 \geq 0$$

4 Solve the linear programming problem by simplex method.

$$\text{Min } z = 3x_1 + 2x_2$$

$$\text{s.t. } 2x_1 + x_2 \geq 2$$

$$3x_1 + 4x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

5 Determine an Initial Basic Feasible Solution by 1) North West corner method.
2) Least cost method.

Source	Destination				Supply
	O1	O2	O3	O4	
D1	1	2	1	4	35
D2	3	3	2	1	50
D3	4	2	5	9	15
Demand	20	40	30	10	

6 Solve the given Transportation problem by Least cost and VAM method.

Source	Destination				Supply
	D1	D2	D3	D4	
S1	100	200	100	400	30
S2	300	300	200	100	50
S3	400	200	500	900	20
Demand	20	40	30	10	

7 Explain the uv method for solving Transportation problem.

8 For the given Transportation Problem obtain optimal basic feasible solution.

Source	Destination				Supply
	D1	D2	D3	D4	
S1	21	16	15	3	11
S2	17	18	14	23	13
S3	32	27	18	41	19
Demand	6	10	12	15	

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