

Roll No.

Total No. of Pages : 03

Total No. of Questions : 09

M.Sc.(Computer Science) (2019 & Onwards) (Sem.-3)

**OPTIMIZATION TECHNIQUES**

Subject Code : MSC-301

M.Code : 72103

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

1. SECTIONS-A, B, C & D contain TWO questions each carrying TEN marks each and students has to attempt any ONE question from each SECTION.
2. SECTION-E is COMPULSORY consisting of TEN questions carrying TWENTY marks in all.

**SECTION-A**

1. Use Simplex method to solve the following LPP.

$$\text{Maximize } Z = 3x_1 + 4x_2 + x_3$$

subject to constraints

$$x_1 + 2x_2 + 3x_3 \leq 90$$

$$2x_1 + x_2 + x_3 \leq 60$$

$$3x_1 + x_2 + 2x_3 \leq 80$$

$$\text{Where } x_1, x_2, x_3 \geq 0$$

2. Use the dual simplex method to

$$\text{Maximize } Z = -3x_1 - 2x_2$$

subject to constraints

$$x_1 + x_2 \leq 1$$

$$x_1 + x_2 \leq 7$$

$$x_1 + 2x_2 \leq 10$$

$$x_2 \leq 3$$

$$\text{where } x_1, x_2 \geq 0$$

### SECTION-B

3. Find the optimum solution of transportation problem

	<b>1</b>	<b>2</b>	<b>3</b>	<b>Supply</b>
<b>1</b>	2	7	4	5
<b>2</b>	3	3	1	8
<b>3</b>	5	4	7	7
<b>4</b>	1	6	2	14
<b>Demand</b>	7	9	18	34

4. A company has 4 machines to do 3 jobs. Each job can be assigned to one and only one machine. The cost of each job for each machine is given in the following table.

	<b>Machine</b>			
<b>Job</b>	<b>W</b>	<b>X</b>	<b>Y</b>	<b>Z</b>
<b>A</b>	18	24	28	32
<b>B</b>	8	13	17	19
<b>C</b>	10	15	19	22

What are the job assignments which will minimize the cost?

### SECTION-C

5. a) A and B throw alternatively with a pair of balanced dice. A wins if he throws a sum of six points before B throws a sum of seven points while B wins if he throws a sum of seven points before A throws a sum of six points. If A starts the game, show that his probability of winning is  $\frac{30}{60}$ .
- b) Data on the readership of a certain magazine show that the proportion of male under 35 is 0.40 and over 35 is 0.20. If the proportion of readers under 35 is 0.70. Find the proportion of subscribers that are female over 35 years. Also calculate the probability that a randomly selected male subscriber is under 35 years of age.
6. Use dynamic programming to solve the following LPP :

$$\text{Maximize } Z = 3x_1 + 5x_2$$

subject to constraints

$$x_1 \leq 4$$

$$x_2 \leq 6$$

$$3x_1 + 2x_2 \leq 18$$

$$\text{Where } x_1, x_2 \geq 0$$

### SECTION-D

7. Find the optimal solution to the following integer programming problem :

$$\text{Maximize } Z = x_1 + 2x_2$$

subject to constraints

$$x_1 + 2x_2 \leq 12$$

$$4x_1 + 3x_2 \leq 14$$

Where  $x_1, x_2 \geq 0$  and integers.

8. Solve the following integer linear programming problem using Branch and Bound method.

$$\text{Minimize } Z = 3x + 2\frac{1}{2}y$$

subject to constraints

$$x + 2y \geq 20$$

$$3x + 2y \geq 30$$

Where  $x, y \geq 0$

### SECTION-E

9. a) What are the features of OR?  
b) The XYZ company during the festival season combines two factors A and B to form a gift pack which must weight 10kg. At least 4kg of A and not more than 8kg of B. Should be used. The net profit contribution to the company is Rs. 10 per kg for A and Rs. 12 per kg of B. Formulate LPP.  
c) Define Primal problem and Dual problem.  
d) What is Assignment problem? Give two application.  
e) Explain degeneracy in transportation problem.  
f) State and prove addition theorem of probability.  
g) Explain dynamic programming with suitable examples.  
h) Prove that the probability of complementary event A of A is given by

$$P(\bar{A}) = 1 - P(A)$$

- i) Explain cutting plane algorithm.  
j) Define integer programming problem. Why integer programming is needed?

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**