Roll No. | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 09

MCA (2012 & onwards) (Sem.–3)

COMPUTER BASED OPTIMIZATION TECHNIQUES

Subject Code : MCA-302

Paper ID : [B1158]

Time : 3 Hrs. **Max. Marks : 100**

INSTRUCTION TO CANDIDATES :

1. **SECTIONS-A, B, C & D contains 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.**
3. Use of non-programmable **scientific calculator** is allowed.

SECTION-A

I. a) Define Operations Research (OR) and explain its main characteristic features. Also give examples to highlight the scope of Operations research in business and industry.

b) For the following linear programming problem:

i) Identify the variables you will use and say precisely what each one represents,

ii) List all the constraints on the variables and say where each is from,

iii) Identify the objective function.

Solve the problem graphically.

A Stick Company makes two kinds of sticks. Type A sticks require 2 labor-hours for cutting, 1 labor-hour for stringing, and 2 labor-hours for finishing and are sold for a profit of Rs.8. Type B sticks require 1 labor-hour for cutting, 3 labor-hours for stringing, and 2 labor-hours for finishing and are sold for a profit of Rs.10. Each day the company has available 120 labor-hours for cutting, 150 labor-hours for stringing, and 140 labor-hours for finishing. How many sticks of each kind should be manufactured each day to maximize profits?

2. Apply the principle of duality to solve the following L.P.P. :

Maximize $z = 3x_1 - 2x_2$

Subject to the constraints :

$x_1 + x_2 \leq 5$

$x_2 \leq 4$

$1 \leq x_2 \leq 6$

$x_1, x_{2 \geq 0}$

SECTION-B

3. A company has a team of four salesmen and there are four districts where the company wants to start its business. The following is the profit per day in rupees for each salesman in each district:

Districts

Salesmen		**D1**	**D2**	**D3**	**D4**
	A	16	10	14	11
	B	14	11	15	15
	C	15	15	13	12
	D	13	12	14	15

Find the assignment of salesmen to various districts which will yield maximum profit, using the 'Hungarian Assignment Method'.

4. A company has three plants at locations A, B and C, which supply to warehouses located at D, E, F, G, and H. Monthly plant capacities are 800, 500 and 900 units respectively. Monthly warehouse requirements are 400, 400, 500, 400 and 800 units respectively. Unit representation costs (in Rs) are given below:

		To				
		D	E	F	G	H
From	A	5	8	6	6	3
	B	4	7	7	6	6
	C	8	4	6	6	4

Determine an optimum distribution for the company in order to minimize the total transportation cost.

SECTION-C

5. Define a dynamic programming problem. Give various applications of dynamic programming. Write the principle of optimality. Discuss the basic features which characterize the dynamic programming problem. Explain how to solve the Travelling salesman problem by the Dynamic Programming Approach.

6. a) If $P(A) = 0.3$, $P(B) = 0.2$, and $P(C) = 0.1$ and A, B, C are independent events, find the probability of occurrence of at least one of the three events A, B and C.

   b) Two dice are thrown. What is the probability of getting the sum being 8 ?

SECTION-D

7. Explain in detail Gomory's cutting-plane algorithm for solving an integer linear programming problem, by taking suitable example.

8. Solve the following integer programming problem using Branch and bound technique:

   Maximize $Z = 10x_1 + 20x_2$;

   subject to the constraints :

   $6x_1 + 8x_2 \leq 48$, $x_1 + 3x_2 \leq 12$, $x_1, x_2 \geq 0$ and integers

SECTION-E

9. a) Give origin of operations research.

   b) What is Linear Programming?

   c) Define surplus and slack variables.

   d) What do you mean by Sensitivity Analysis?

   e) What is degeneracy problem in transportation problems?

   f) Differentiate between balanced and unbalanced transportation problem.

   g) Define sample space in probability.

   h) What is Decision Theory?

   i) What is the economic interpretation of Dual Variables?

   j) Give applications of integer programming.