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 TWENTY 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

1) Consider the following linear program (LP) :

Minimize $Z = 3x_1 + 2x_2$

Subject to

$x_1 + 2x_2 \leq 12$

$2x_1 + 3x_2 = 12$

$2x_1 + x_2 \geq 8$

and $x_1 \geq 0, \quad x_2 \geq 0$

a) Plot the feasible region

b) Determine all corner point feasible (CPF) solutions.

c) Determine all basic feasible (BF) solutions.

d) Determine all optimal solutions.

e) If Constraint (1) changed from $x_1 + 2x_2 \leq 12$ to $x_1 + 2x_2 \geq 12$, what is the optimal solution? (5×4=20)

2) Find the dual of the following primal linear programming problem and solve the primal from the solution of the dual problem:

Minimize $Z = 3x_1 + 2x_2 + x_4$

Subject to

$2x_1 + x_2 + x_3 + 2x_4 \geq 7$

$x_2 + 3x_4 = 5$

$x_1, x_2 \geq 0, \quad x_3 \leq 0, x_4$ unrestricted. (20)

SECTION-B

3) Consider the transportation problem having the following parameter table :

	Destination			
	1	**2**	**3**	**Supply**
Source 1	13	16	15	18
Source 2	18	15	16	14
Demand	10	5	10	

a) Use the Northwest corner rule to obtain an initial basic feasible solution and objective function value. (10)

b) Use the transportation simplex method to find an optimal solution. Identify the optimal solution and the objective function value. (10)

4) Consider the problem of assigning four operators to four machines. The assignment costs in Rupees are given below. Operator 1 cannot be assigned to machine 3 and operator 3 cannot be assigned to machine 4. Find the optimal assignment using the 'Hungarian Assignment Method'.

		Machine			
		1	**2**	**3**	**4**
Operator	**1**	5	5	-	2
	2	7	4	2	3
	3	9	3	5	-
	4	7	2	6	7

(20)

SECTION-C

5) What is dynamic programming? Differentiate between deterministic and probabilistic dynamic programming. Give applications of dynamic programming? (20)

6) a) Let A and B be events defined on some sample space, with P(A) = 1/3, P(B) = 1/4, and P(A ∩ B) = l/6. Find the probability that exactly one of the events A, B occur. (10)

b) Among 35 students in a class, 17 earned "A" on the midterm, 14 earned "A" on final exam, and 11 did not earn "A" on either exam. What is the probability that a randomly selected student from this class earned "A" on both exams? (10)

SECTION-D

7) Solve the following LPP by the Gomory algorithm :

Maximize $Z = 20x_1 + 22x_2 + 18x_3$

Subject to the constraints

$4x_1 + 6x_2 + x_3 \geq 54$

$4x_1 + 4x_2 + 6x_3 \geq 65$

$x_1, x_2, x_3 \geq 0$, each ≤ 7 and integers.

8) Solve the following integer LPP using branch-and-bound algorithm :

Maximize $Z = 2x_1 + 10x_2 + x_3$

Subject to constraints :

$5x_1 + 2x_2 + x_3 \leq 15$

$2x_1 + x_2 + 7x_3 \leq 20$

$x_1 + 3x_2 + 2x_3 \leq 25$

$x_1, x_2, x_3 \geq 0$, and integers.

SECTION-E

9) Write briefly :

a) Explain the main characteristic features of Operations Research.

b) Name various OR models.

c) What is linear programming? What are its major assumptions?

d) What is meant by degeneracy in a linear programming problem?

e) Explain how the assignment problem can be treated as a particular case of transportation problem.

f) Explain the Role of Sensitivity Analysis in decision making.

g) Discuss the economic interpretation of Dual Variables.

h) What is unbalanced transportation problem? Explain.

i) What is decision theory?

j) Give definition of probability.