

## ALCCS

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Code: CS42

Subject: OPERATIONS RESEARCH AND SYSTEM SIMULATION

Time: 3 Hours

Max. Marks: 100

**MARCH 2010**
**NOTE:**

- Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.
  - Parts of a question should be answered at the same place.
  - All calculations should be up to three places of decimals.
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- Q.1** a. Discuss how revised simplex method can be used to improve computational efficiency of solving a linear programming problem.
- b. Discuss the economic interpretation of the dual problem.
- c. Differentiate between unbounded solution and infeasible solution in the context of solution to linear programming problem.
- d. Explain what is an unbalanced transportation problem.
- e. Discuss four applications of integer programming.
- f. Discuss degeneracy in linear programming problem?
- g. Discuss the role of Operations Research in decision making. (7 × 4)
- Q.2** a. What is the standard form of linear programming problem and how do you obtain it? Also discuss special cases that arise in application of simplex method. (9)
- b. Use penalty method to solve the following linear programming problem: Maximize  $z =$   
 $2x_1 + x_2 + x_3$   
 Subject to  
 $4x_1 + 6x_2 + 3x_3 \leq 8$ ,  $3x_1 - 6x_2 - 4x_3 \leq 1$ ,  $2x_1 + 3x_2 - 5x_3 \geq 4$   
 and  $x_1, x_2, x_3 \geq 0$ . (9)
- Q.3** a. What are various algorithms for finding initial basic solution for a transportation problem? Discuss them. (9)
- b. Determine the basic feasible solution, if exists, to the following transportation problem using Vogel's Approximation method. problem using Vogel's
- | Sources     | Distribution Centres |    |    |    | Supply |
|-------------|----------------------|----|----|----|--------|
|             | D1                   | D2 | D3 | D4 |        |
| S1          | 2                    | 3  | 11 | 7  | 6      |
| S2          | 1                    | 0  | 6  | 1  | 1      |
| S3          | 5                    | 8  | 15 | 9  | 10     |
| Requirement | 7                    | 5  | 3  | 2  |        |
- (9)
- Q.4** a. What are various algorithms for solving an Integer Linear programming problem? Discuss branch and bound method in detail. (9)

- b. Using the cutting plane method, solve the following Integer Linear Programming Problem

$$\text{Maximize } z = 7x_1 + 10x_2$$

$$\text{Subject to } -x_1 + 3x_2 \leq 6, 7x_1 + x_2 \leq 35, x_1, x_2 \text{ are non-negative integers.} \quad (9)$$

- Q.5** a. Discuss in detail the various parameters for designing and evaluating a simulation based experiments. (9)

- b. A student has to take examination in three courses x, y, z. He has three days available for study. He feels that it would be best to devote a whole day to study the same course so that he may study a course for one day, two days or three days or not at all. His estimates of grades he may get by studying are as follows.

Study days/courses	x	y	z
0	1	2	1
1	2	2	2
2	2	4	4
3	4	5	4

How should the student plan to study so that the grades obtained are maximized?

(9)

- Q.6** a. Discuss Hungarian Assignment algorithm in detail. (9)

- b. A department has five employees with five jobs to be performed. The time (in hrs) each man will take to perform each job is given by the following cost matrix:

		Employees				
		I	II	III	IV	V
Jobs	A	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

How should jobs be allocated one per employee so that total the man-hours can be maximized?

(9)

- Q.7** Write a short note on any **THREE** of the following:

- (i) GPSS.
- (ii) Degeneracy in Transportation Problem.
- (iii) Sensitivity and Parametric Analysis.
- (iv) Monte Carlo Method.

(6+6+6)