



Name :
Roll No. :
Invigilator's Signature :

CS/MMA/SEM-1/MMA-101/2011-12

2011

QUANTITATIVE METHODS – I

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$
 - i) The scientific method in O.R. study generally involves
 - a) Judgment phase b) Research phase
 - c) Action phase d) all of these.
 - ii) Which of the following is not a major requirement of a Linear Programming Problem ?
 - a) There must be alternative course of action among which to decide
 - b) An objective for the firm must exist
 - c) The problem must be of maximization type
 - d) Resources must be limited.



- iii) Which of the following assertions is true of an optimal solution to a Linear Programming Problem ?
- a) Every LP has an optimal solution
 - b) The optimal solution always occurs at extreme points
 - c) If an optimal solution exists, there will always be at least one at a corner
 - d) All of these.
- iv) An objective function in a linear program can be which of the following ?
- a) A maximization function
 - b) A nonlinear maximization function
 - c) A quadratic maximization function
 - d) An uncertain quantity.
- v) Which of the following is an essential condition in a situation for linear programming to be useful ?
- a) Competing objectives b) Nonlinear constraints
 - c) Uncertainty d) Homogeneity.
- vi) Which of the following is a common application of linear programming in operations management ?
- a) Cost of quality studies
 - b) Plant location studies
 - c) Cost allocation studies
 - d) Product design decisions.



- vii) The North West Corner rule
- is used to find an initial feasible solution
 - is used to find an optimal solution
 - is based on the concept of minimizing opportunity cost
 - none of these.
- viii) In Vogel's Approximation Method, the opportunity cost associated with a row is determined by
- the difference between the smallest cost and the next smallest cost in the row
 - the difference between the smallest unused cost and the next smallest unused cost in the row
 - the difference between the smallest cost and next smallest unused cost in the row
 - none of these.
- ix) Which of the following statements about an LP problem and its dual is false ?
- The dual problem might have an optimal solution, even though the primal has no (bounded) optimum
 - If the primal and the dual both have optimal solutions, the criterion function for both problems are equal at the optimum
 - If one of the variables in the primal has unrestricted sign, the corresponding constraint in the dual is satisfied with equality
 - If the primal has an optimal solution, so has the dual.



- x) Introduction of dummy variable in the assignment problem in case of
- maximization in assignment problem
 - multiple optimal solution
 - unbalanced assignment problem
 - all of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- What do you mean by operation research ? Explain the different phases of OR. $2 + 3$
- Briefly discuss about the essential characteristics of Linear Programming Model.
- Write the dual of the following primal LP problem :

$$\text{Max } Z = x_1 + 2x_2 + x_3$$

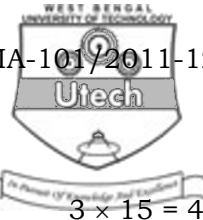
$$\text{Subject to } 2x_1 + x_2 - x_3 \leq 2$$

$$-2x_1 + x_2 - 5x_3 \geq -6$$

$$4x_1 + x_2 + x_3 \leq 6$$

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

- Explain the principal assumptions made while dealing with sequencing problem.
- Discuss Kendall's Notation for representing queuing models.



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following.

3 × 15 = 45

7. a) Discuss the basic properties of an LP Model ? 3
 b) Establish the general expression of an LPP. 4
 c) Solve the following by graphical method : 8

$$\text{Max } Z = 5x_1 + 8x_2$$

$$\text{Subject to } 3x_1 + 2x_2 \leq 36$$

$$x_1 + 2x_2 \leq 20$$

$$3x_1 + 4x_2 \leq 42$$

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

8. a) Establish the primal-dual relationship with an example. 5
 b) Solve the following LPP by simplex method : 10

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

$$\text{Subject to } 4x_1 + 3x_2 \leq 2$$

$$4x_1 + x_2 \leq 8$$

$$4x_1 - x_2 \leq 8$$

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

9. a) Explain degeneracy in a Transportation Problem and how to resolve it. 4



- b) Find the minimum transportation cost. 11

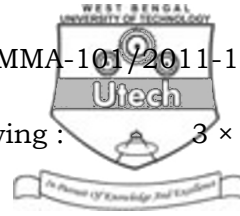
Warehouse

	D_1	D_2	D_3	D_4	Supply
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Demand	5	8	7	14	

10. a) Explain the difference between a transportation problem and an assignment problem. 4
- b) Give a mathematical formulation of the assignment problem. 4
- c) There are five jobs to be assigned, one each to 5 machines and the associated cost matrix is as follows : 7

Machines

	1	2	3	4	5
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15



11. Write short notes on any *three* of the following : 3×5

- a) North West Corner Rule
- b) Unbalanced Transportation Problem
- c) Hungarian Method
- d) Method of processing n jobs through three machines A, B, C
- e) Classification of Queueing Models.

=====