

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS / MMA / SEM-1 / MMA-101 / 2010-11**

**2010-11**

**QUANTITATIVE METHOD - 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.*

*Note : Graph sheet is to be supplied by institution.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) A solution is called feasible if it satisfies
  - a) objective function and constraints
  - b) objective function and non-negativity
  - c) constructs and non-negativity
  - d) none of these.



- ii) A redundant constraint is a
- a) binding constraint      b) non-binding constraint
  - c) both (a) and (b)      d) none of these.
- iii) Which of the following is not an assumption underlying LPP ?
- a) certainty      b) additivity
  - c) transitivity      d) finite choice.
- iv) In Transportation problem, the methods available to obtain initial basic feasible solution are
- a) north-west corner method
  - b) least cost method
  - c) Vogel's approximation method
  - d) all of these.
- v) An optimal solution is always a
- a) Feasible solution      b) Infeasible solution
  - c) Unbounded solution      d) None of these.
- vi) Which of the following is a method of solving assignment problem ?
- a) Stepping stone method
  - b) Hungarian method
  - c) Vogel's approximation method
  - d) Modified distribution method.



- vii) One of the conditions that should be satisfied in order that multiple optimal solutions exist is
- the objective function should non-linear
  - the objective function should have  $n$ -number of variables.
  - the objective function should be parallel to a constraint that forms an edge or boundary on the feasible region.
  - all of these.
- viii) In order that the simplex method may be applied to a linear programming problem, which of the following condition must be satisfied ?
- The right-hand side of each of the constraints should be non-negative
  - The right-hand side of each of the constraints should be negative.
  - There should be  $n$ -number of constraints
  - None of these.
- ix) In simplex method, the constraints involving “greater than or equal to sign” may be reduced to equations by
- subtracting slack variables and adding artificial variables.
  - subtracting artificial variables and adding slack variables
  - adding slack variables and artificial variables
  - subtracting slack and artificial variable.



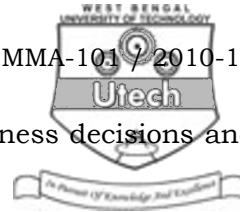
- x) A transportation problem is called degenerate if the no. of initial solution is
- equal to (row + column – 1)
  - greater than (row + column – 1)
  - less than (row + column – 1)
  - none of these.
- xi) Which of the following probability distribution is not related with queuing system ?
- Normal distribution
  - Exponential distribution
  - Poisson distribution
  - Geometric distribution.
- xii) Which of the following is not associated with sequencing problem.
- Waiting time
  - Service time
  - Elapsed time
  - Repairing time.

### GROUP – B

#### ( Short Answer Type Questions )

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

- Explain the concept of binding and non-binding constraint with the help of an example.
- Explain the primal - dual relationship in detail.
- What is a degenerate transportation problem ? How can you solve it ?



5. Explain the role of queuing theory in business decisions and discuss its applications.
6. Give the steps of solving sequencing problem by Johnson's rule for processing  $n$ -jobs through 3 machines.

### GROUP – C

#### ( Long Answer Type Questions )

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) Solve the following LPP by graphical method :  
 Maximize  $Z = 4x_1 + 3x_2$   
 subject to  $x_1 + x_2 \leq 50$   
 $x_1 + 2x_2 \leq 80$   
 $2x_1 + x_2 \geq 20$   
 and  $x_1, x_2 \geq 0$ .
- b) Solve the following LPP by simplex method :  
 Maximize  $Z = 2x_1 + 3x_2$   
 subject to  $x_1 + x_2 \leq 8$   
 $x_1 + 2x_2 = 5$   
 $2x_1 + x_2 \leq 8$   
 and  $x_1, x_2 \geq 0$ .  $5 + 10$
8. Find the dual of the following LPP and solve the dual problem. Also obtain the solution of the primal problem :  
 Maximize  $Z = 3x_1 + 4x_2$   
 subject to  $x_1 + x_2 \leq 12$   
 $2x_1 + 3x_2 \leq 21$   
 $x_1 \leq 8$   
 $x_2 \leq 6$   
 and  $x_1, x_2 \geq 0$ . 15



9. a) Show that an assignment problem is a special case of LPP.
- b) The head of the department has five jobs A, B, C, D, E and 5 sub-ordinates I, II, III, IV, V. The number of hours each man would take to perform each job is as follows. How would the jobs be allocated to minimize the total time ?

	I	II	III	IV	V
A	3	5	10	15	8
B	4	7	15	18	8
C	8	12	20	20	12
D	5	5	8	10	6
E	10	10	15	25	10

5 + 10

10. a) In a factory, there are six jobs to perform. The processing time (hrs.) for the jobs are given below. Find the optimum sequence for performing the jobs that would minimize the total elapsed time. Find total elapsed time.

Job	1	2	3	4	5	6
Machine-A	7	4	2	5	9	8
Machine-B	3	8	6	6	4	1

- b) Consider the situation, where the mean arrival rate is one customer every 4 minutes and the mean service time is 2.5 minutes, calculate the
- average number of customers
  - average queue length
  - average time a customer spends in the system
  - average time a customer waits before being served.

7 + 8



11. Obtain the optimal solution of the following transportation problem with the cost matrix given below :

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	D <sub>6</sub>	Availability
S <sub>1</sub>	1	2	1	4	5	2	30
S <sub>2</sub>	3	3	2	1	4	3	50
S <sub>3</sub>	4	2	5	9	6	2	75
S <sub>4</sub>	3	1	7	3	4	6	20
Requirement	20	40	30	10	50	25	

15

=====