

**PARUL UNIVERSITY**  
**FACULTY OF MANAGEMENT**  
**MBA., Winter 2017 - 18 Examination**

**Semester: 2**  
**Subject Code: 06200157**  
**Subject Name: Operation Research**

**Date: 18/01/2018**  
**Time: 02:00PM to 04:30PM**  
**Total Marks: 60**

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**Instructions**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Do as Directed.****A).Multiple choice type questions/Fill in the blanks. (Each of 1 mark)****(05)**

1. Which of the following is not an assumption of an LP model
  - a) divisibility
  - b) Multiplicability
  - c) Additivity
  - d) Proportionality
2. If primal has an unbounded solution, dual has
  - a) No feasible solution
  - b) Feasible solution
  - c) Unbounded solution
  - d) None of the above
3. A game is said to be fair if
  - a) Both upper and lower values of games are same
  - b) Upper and lower values of games are not same
  - c) Both upper and lower values of games are same and zero
  - d) None of the above
4. Which of the following criterion is not used for decision making under uncertainty?
  - a) Maximin
  - b) Maximax
  - c) Minimax
  - d) Minimize Expected Loss
5. Which technique is used to imitate on operation prior to actual performance?
  - a) Simulation
  - b) Linear Programming
  - c) Queuing Theory
  - d) Network Model

**B).Define the following. (Each of 1 mark)****(05)**

1. Optimal Strategy
2. System Length
3. Expected Monetary Value
4. Feasible Solution
5. Minimum Spanning Tree

**C).Direct questions. (Each of 1 mark)****(05)**

1. What is saddle point?
2. What is Monte Carlo Simulation?
3. When does degeneracy generate in transportation problem?
4. What is zero sum game?
5. Write the relation between primal and dual?

**Q.2 Answer the following questions.****A).What are the components of an LPP? What does the non-negativity restriction mean?****(07)****B).What are advantages and limitations of simulation?****(08)**

**Q.3 Answer the following questions.**

A). Obtain the dual of problem of the following primal LP problem: Also comment on the result. (07)

Minimize Z:  $x + 2y$

Subject to constraints:

$$2x + 4y \leq 160$$

$$x - y = 30$$

$$x \leq 10$$

and  $x, y \geq 0$

B). A company plans to assign 5 salesmen to 5 districts in which it operates. Estimates of sales revenue in thousands of rupees for each salesman in different districts are given in the following table. In your opinion, what should be the placement of the salesmen if the objective is to maximize the expected sales revenue? (08)

Salesman	District				
	D1	D2	D3	D4	D5
S1	40	46	48	36	48
S2	48	32	36	29	44
S3	49	35	41	38	45
S4	30	46	49	44	44
S5	37	41	48	43	47

**Q.4 Attempt any two questions. (Each of 7.5 mark) (15)**

1. A firm produces two products P and Q, which yield a contribution margin of Rs 200 and Rs 300 per unit, respectively. The firm has a limited capacity in the two departments where these products need processing. The availability and requirements are given below. A firm wants to maximize the profit. formulate it the LPP.

Department	Processing Time (hours)		Daily Availability (hours)
	Product P	Product Q	
I	4	2	45
II	4	4	70

2. Arrivals at a telephone booth are considered to be Poisson, with an average time of 10 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially, with mean 3 minutes. Find
1. The average number of persons waiting and making telephone calls
  2. The expected time that a person is waiting and making a telephone call.
  3. The average length of non empty queue that is formed from time to time.
  4. The expected time that a person wait in the queue to make a telephone call
  5. The average number of persons waiting to make a telephone call
3. A bakery keeps stock of a popular brand of cakes. Previous experience shows the daily demand pattern for the item with associated probabilities, as given:

Demand / week	0	5	10	15	20	25
Frequency	2	11	8	21	5	3

Use the following sequence of random numbers to simulate the demand for next 10 days. Also find out the average demand per day.

Random numbers: 25, 39, 65, 76, 12, 05, 73, 89, 19, 49

4. Write steps of Minimum-Spanning Tree