# PARUL UNIVERSITY
### FACULTY OF MANAGEMENT
### MBA Winter, 2019 - 20 Examination

Semester: 2                                             Date: 14/12/2019
Subject Code: 06200157                                 Time: 10:30 am to 01:00pm
Subject Name: Operation Research                       Total Marks: 60

**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.** Graphical method can be applied to solve a LPP when there are only _____ variable
  a) One                                   c) More than one
  b) Two                                   d) Three

**2** The right hand side constant of a constraint in a primal problem appears in the corresponding dual as _____
  a) A Co-efficient in the objective function   c) Right hand side of a constraint

  b) An input out coefficient                   d) None of the above

3 In a  6 X 6 assignment problem, the number of allocated cells are:
  a) 6                                     c)31
  b) 11                                    d) 36

4 A game is said to be fair
  a) Both upper and lower value of game are same and zero   c) upper  value is more than lower value of the game
  b) upper and lower value of game are not equal            d) None of the above

5 The utilization  factor for a system  represents:
  a) the steady state average time                    c) the probability that the service facility is in use
  b) The probability that no one is in the system     d) the average number of customers in the queue

**B).Define the following.  (Each of 1 mark)**                                                 (05)
  1. Length of Queue
  2. Degeneracy in transportation problem
  2. Payoff Matrix
  4.  Unbounded solution
  5.  Saddle point

**C).Direct questions.  (Each of 1 mark)**                                                     (05)
  1. Differentiate between Feasible Solution & Optimal Solution
  2. What is unbalanced Assignment problem
  3. Differentiate between Maximin and Minimax  Principle
  4. Explain the **Laplace** principles of decision making.
  5. State the different components of lpp

**Q.2** Answer the following questions.

**A).**
HLL is considering the problem of marketing a new product. There are two factors that are uncertain – annual demand and profit. The management has the past data regarding the possible levels of two factors:

| Annual Demand | Probability | Profit | Probability |
|---|---|---|---|
| 1000 | 0.1 | 3.00 | 0.1 |
| 2000 | 0.2 | 5.00 | 0.2 |
| 3000 | 0.4 | 7.00 | 0.4 |
| 4000 | 0.2 | 9.00 | 0.2 |
| 5000 | 0.1 | 10.00 | 0.1 |

**(07)**

Using Monte-Carlo simulation, determine the following:
   a.   Average Demand
   b.   Average Profit
Random Number. for Demand : 35, 55, 10, 30, 70
Random Number for Profit: 15, 80, 50, 90, 30

**B).**
Find the optimum solution of the following transportation problem:

|  | I | II | III | IV | Supply |
|---|---|---|---|---|---|
| A | 21 | 16 | 25 | 13 | 11 |
| B | 17 | 18 | 14 | 23 | 13 |
| C | 32 | 27 | 18 | 41 | 19 |
| Demand | 6 | 10 | 12 | 15 | |

**(08)**

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

**A).**
A Xerox machine in an office is operated by a person who does other jobs also. The average service time for a job is 6 minutes per customer. On an average, in every 12 minutes one customer arrives for Xeroxing. Find:
   i.      The Xeroxing machine utilization
   ii.     Average time spent by a customer
   iii.    Average queue length

**(07)**

**B).**
In a textile sales emporium, four salesmen A, B, C and D are available to four counters W, X, Y and Z. Each salesman can handle any counter. The service (in hours) of each counter when managed by each salesman is given below:

|  | A | B | C | D |
|---|---|---|---|---|
| W | 41 | 72 | 39 | 52 |
| X | 22 | 29 | 49 | 65 |
| Y | 27 | 39 | 60 | 51 |
| Z | 45 | 50 | 48 | 52 |

**(08)**

How the salesmen should be allocated to appropriate counters so that the service time is minimized.

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

1. Find the dual of the following Primal:
   Minimize $Z = x1 + x2 + x3$
   Subject to
           x1 - 3x2 + 4x3 =5
           x1 - 2 x2  <= 3
           2x2 – x3 >=4
   Where x1, x2 >=0, x3 is unrestricted

2. State and explain various assumptions of Linear programming model

3. Solve by minimum spanning tree technique and find the total length
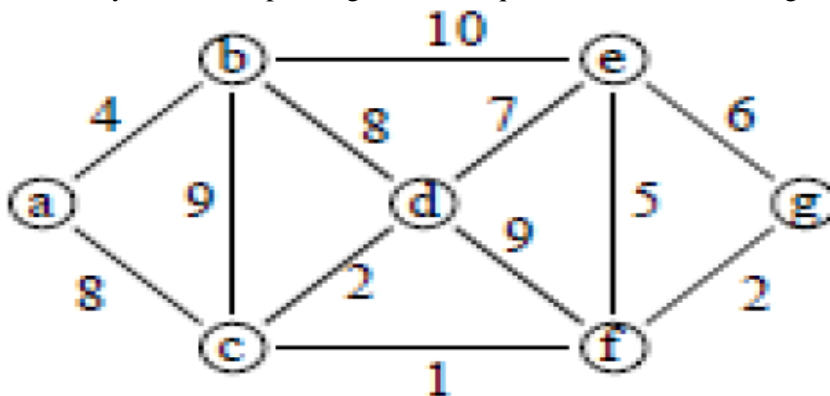


4. Solve the given lpp by graphical method:
 Max Z = 40x1 + 80 x2
Subject to
2x1 + 3x2 <=48
X1 <= 15
X2 <= 10
X1, x2 >=0