# PARUL UNIVERSITY
### FACULTY OF MANAGEMENT
### MBA Summer 2018 - 19 Examination

Semester: 2                                    Date: 01/05/2019
Subject Code: 06200157                          Time: 10:30 am to 01:00 pm
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. The objective functions and constraints are linear relationship between _____
   - a) Variables
   - b) Functions
   - c) Constraints
   - d) All of the above

2. Every LPP is associated with another LPP is called _____
   - a) Primal
   - b) Non-linear Programming
   - c) Dual
   - d) None of the above

3. Which of the following method is used to verify the optimality of the current solution of the transportation problem?
   - a) Least Cost Method
   - b) Modified Distribution Method
   - c) Vogel's Approximation  Method
   - d) All of the above

4. The purpose of using simulation technique is to
   - a) Imitate a real world situation
   - b) Reduce the cost of experiment on a model of real situation
   - c) Understand properties and operating characteristics of complex real life
   - d) All of the above

5. Which of the following is not a key operating characteristic apply to queuing System?
   - a) Utilization Factor
   - b) Average time spent waiting in the system and queue
   - c) Percent Idle time
   - d) None of the above

**B).Define the following.  (Each of 1 mark)**                                    (05)
1. Feasible Region
2. Degeneracy
3. Unbalanced transportation problem
4. Utilization Factor
5. Two-person zero sum game

**C).Direct questions.  (Each of 1 mark)**                                    (05)
1. State various assumptions of Linear programming problem
2. Block diagram of OR problem solving methodology
3. Write the relation between Primal & dual (Any two)
4. What is unbounded solution in case of lpp?
5. What is saddle point?

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

**A).** A physician purchases a particular vaccine on Monday of each week. The vaccine must be used within the week following, otherwise it becomes worthless. The vaccine costs Rs. 20 per dose and the physician charges Rs. 60 per dose. In the past 50 weeks, the physician has administered the vaccine in the following quantities: **(07)**

| Doses per week | 20 | 25 | 40 | 60 |
|---|---|---|---|---|
| no. of weeks | 5 | 15 | 25 | 5 |

a) Draw up a pay-off matrix
b) Obtain a regret matrix
c) Determine the optimum number of doses the physician should buy

**B).** A product is manufactured by four factories A, B, C and D. Their production capacities are 50, 70, 30 and 50 units respectively. These factories supply the product to four stores, demand of which are 25, 35, 105 and 20 units respectively. Unit transportation cost in Rs. from each factory to each store is given below:

Stores

| | | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| | A | 2 | 4 | 6 | 11 |
| Factories | B | 10 | 8 | 7 | 5 |
| | C | 13 | 3 | 9 | 12 |
| | D | 4 | 6 | 8 | 3 |

**(08)**

Determine the transportation plan to optimize the transportation cost

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

**A).** Suggest optimum assignment to sales territories of maximization problem, where the estimates of sales to be made by each salesman in different territories are given below:

Territories

| | | I | II | III | IV | V |
|---|---|---|---|---|---|---|
| | A | 10 | 15 | 17 | 14 | 14 |
| Salesman | B | 6 | 18 | 10 | 12 | 16 |
| | C | 12 | 5 | 13 | 13 | 6 |
| | D | 8 | 11 | 16 | 10 | 12 |

**(07)**

**B).** A company manufactures two kinds of machines, each requiring different manufacturing techniques. The deluxe machine requires 18 hours of labour, 9 hours of testing and yields a profit of Rs. 400. The standard machine requires 3 hours of labour, 4 hours of testing and yields a profit of Rs. 200. There are 800 hours of labour and 600 hours of testing available each month. A marketing forecast has shown the monthly demand for the standard machine to be no more than 150. The management wants to know the numbers of each model to produce monthly that will maximize total profit. Formulate and solve this as a linear programming problem. **(08)**

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

1. Write the dual of the following primal:

Min $Z = 2x_1 + 3x_2 + 4x_3$
Subject to
$2x_1 + 3x_2 + 5x_3 >= 2$
$3x_1 + x_2 + 7x_3 = 3$
$X_1 + 4x_2 + 6x_3 <= 5$
$x_1, x_2 > 0$, $x_3$ is unrestricted

2. A self-service store employs one cashier at its counter. Nine customers arrive every five minutes, while the cashier can serve ten customers in five minutes. Assuming Poisson distribution for the arrival rate and exponential distribution for service time, find the following:
a) Utilization factor
b) The average number of customers in the system.
c) The average number of customers in the queue
d) The average time a customer spends in the system
e) The average time a customer waits before being served

3. Solve minimum spanning tree
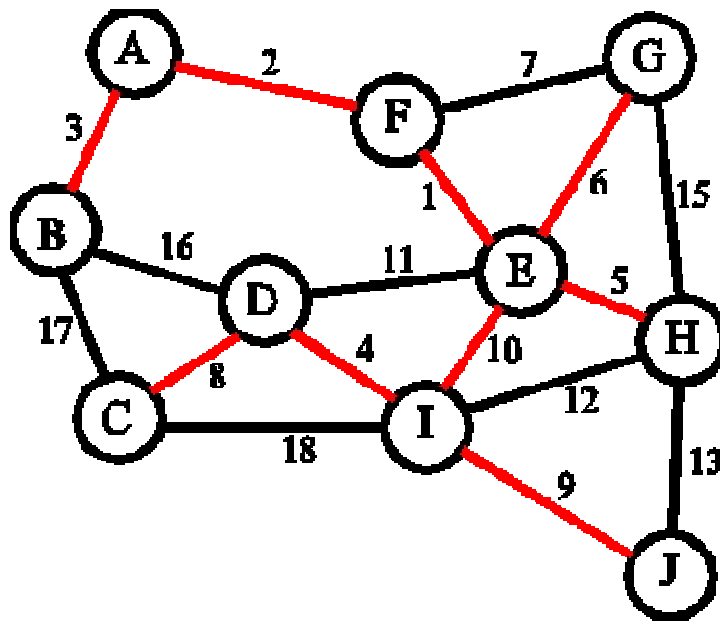


4. HLL is considering the problem of marketing a new product. There are two factors that are uncertain – annual demand and profit. The management has the past data regarding the possible levels of two factors:

| 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 |

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