



INDIAN INSTITUTE OF MATERIALS MANAGEMENT
Post Graduate Diploma in Logistics Management
Paper 6

Dec 2014

OPERATIONS RESEARCH AND QUANTITATIVE TECHNIQUES IN LOGISTICS

Date : 14.12.2014
Time : 2.00 p.m. to 5.00 p.m.

Max Marks : 100
Duration : 3 hours

Instructions :

- 1) Answer all questions in PART A each question carries 1 mark Total 25 marks
- 2) Attempt any four questions in PART B each question carries 15 marks 75 marks

PART A

1 x25 = 25 marks

Q.1 State TRUE or FALSE:

[1 Mark Each]

- a) Probability is the study of random or nondeterministic experiments.
- b) A feasible solution is a solution for which all constraints are satisfied.
- c) Optimal solution does not have the most favorable values of the objective function.
- d) The objective of Transportation Problem is to maximize cost.
- e) The selection of the appropriate order in which waiting customers are served is called sequencing.
- f) The time lag required to obtain the delivery of fresh supplies is Safety Stock.
- g) Payback Period is period required to recover original cash outflow invested in a project.
- h) The Breakeven Point is the point where the sales volume generates huge amount of profit.
- i) Fixed costs remain unchanged within a relevant range of activity.
- j) Simulation is imitation of reality.

Q.2. Fill in the blanks:

[1 Mark Each]

- a) Any realistic business situation involves _____ features.
- b) _____ costs change in direct proportion to an activity level.
- c) _____ is an effort that requires resources and time for completion.
- d) Probability of a customer waiting in a queue can have a minimum value of _____
- e) North West Corner method is used to solve _____ Problem.
- f) A _____ is a logical and chronological set of activities and events.
- g) A _____ is a collection of activities and events with a definable beginning and a definable end.
- h) _____ is the general tendency of the data to increase or decrease or stagnate over a long period of time.
- i) _____ customer moves from one queue to another thinking that he will get served faster by doing so.

- j) Wherever there is a problem of _____ , there is scope of application of Operations Research.

Q.3 Match the columns A & B:

[1 Mark Each]

| | |
|------------------------------|----------------------------|
| (1) Least Cost Method | (A) Two variable LPP |
| (2) Inventory Management | (B) Service Rate |
| (3) Graphical Method | (C) Safety Stock |
| (4) Hungarian Method | (D) Transportation Problem |
| (5) Exponential Distribution | (E) Assignment Problem |

PART B

75 marks

(Attempt any five, each question carry 15 marks)

- Q.4** (a) What are the advantages and limitations of Game Theory?
 (b) Mumbai Railway Station has a ticket counter. During the rush hours , customers arrive at the rate of 10 per hour. The average number of customers that can be served is 12 per hour. Find out the following:
 (i) probability that the ticket counter is free
 (ii) average number of customers in the queue.

Q.5 Find out the minimum cost of the below transportation problem by stepping stone method:

| Source | Distributors | | | Supply |
|---------------|--------------|-----------|-----------|-----------|
| | A | B | C | |
| 1 | 2 | 1 | 5 | 10 |
| 2 | 7 | 3 | 4 | 25 |
| 3 | 6 | 5 | 3 | 20 |
| Demand | 15 | 22 | 18 | 55 |

- Q.6** (a) Explain the difference between a transportation and assignment problem.
- (b) The Njoy Toyz Company has four men available for work on separate jobs. Only one man can work on any one job. The cost of assigning each man to each job is given in the following table. Please assign men to jobs so that the total cost of assignment is minimum.

| | | Jobs | | | |
|-----|---|------|----|----|----|
| | | 1 | 2 | 3 | 4 |
| Men | A | 20 | 25 | 22 | 28 |
| | B | 15 | 18 | 23 | 17 |
| | C | 19 | 17 | 21 | 24 |
| | D | 25 | 23 | 24 | 24 |

Q.7 Solve the following by using Simplex Method.

Maximize

$$Z = 6x + 4y$$

Subject to –

$$2x + 3y \leq 120$$

$$2x + y \leq 60$$

Where $x, y \geq 0$.

Q.8 Auto car service provides a single channel water wash service. The incoming arrivals occur at the rate of 4 cars per hour and the mean service rate is 8 cars per hour. Assume that arrivals follow a Poisson distribution and the service rate follows an exponential probability distribution. Determine the following measures of performance:

- What is the average time that a car waits for water wash to begin?
- What is the average time a car spends in the system?
- What is the average number of cars in the system?

Q.9 A machine costs INR 500 to operate, while maintenance costs are zero for the first year , increasing by INR 100 every year. If the interest rate is 5% every year, determine the best age at which the machine should be replaced.

Q.10 (a) What is payback period? How is it useful in decision making? What are the limitations of payback period?

(b) Solve the following problem by using Graphical Method:

$$\text{Maximize } Z = 3x+4y$$

Subject to-

$$X+y \leq 450$$

$$2x+y \leq 600$$

Where $x, y \geq 0$.

Q.11 (a) Write Short note on Simulation.

(b) Describe the steps of simulation process
