



INDIAN INSTITUTE OF MATERIALS MANAGEMENT

Dec 2012

Post Graduate Diploma in Logistics Management

Paper 6

OPERATIONS RESEARCH AND QUANTITATIVE TECHNIQUES IN LOGISTICS

Date : 09.12.2012
Time : 2.00 p.m. to 5.00 p.m.

Max Marks : 100
Duration : 3 hours

Instructions :

- 1) Part A- Answer all questions
- 2) Part B-Answer any three questions . Each sub question carries one mark
Total Marks=48
- 3) Part C -Compulsory

Total Marks=32

Total Marks=20

Part A

1 x32 = 32marks

Q. 1 Which of the following is correct

1. OR approach is typically based on the use of
 - a) Mathematical Model
 - b) Physical Model
 - c) Ionic Model
 - d) Descriptive Model
2. The qualitative approach to decision analysis relies on
 - a) Experience
 - b) Intuition
 - c) Judgment
 - d)All of the above
3. Constraints in an LP model represents
 - a) limitations
 - b) requirements
 - c) balancing limitations and requirements
 - d) all of the above
4. Which of the following is an assumption of an LP model
 - a) divisibility
 - b) additivity
 - c) proportionality
 - d) all of the above
5. Which cost can vary with order quantity
 - a) Unit cost only
 - b) reorder cost only
 - c) holding cost only
 - d) all of the above

6. If small orders are placed frequently rather than placing large orders infrequently, then total inventory cost
- a) increases
 - b) reduces
 - c) either increase or reduces
 - d) is minimized
7. Interval time distribution is denoted by
- a) D
 - b) M
 - c) G
 - d) All of the above
8. The problem of replacement is felt when job performing units fail
- a) Suddenly
 - b) Gradually
 - c) Both suddenly & gradually
 - d) suddenly but not gradually

Q. 2 Fill in the blanks

1. Every ---- model must represent data in numerical form.
2. LP stands for -----
3. A linear programming technique improves the quality of -----
4. Total inventory cost = Purchase Cost + -----+ Carrying Cost + Shortage Cost
5. If the unit cost rises, then optimal order quantity-----
6. Purchase cost = price per unit x -----
7. Customers from a queue are selected for service according to certain rules known as ---
8. Queue Length = (-----) + (The no of customers being served)

Q. 3 Match the following

- | | |
|--|---|
| 1. Ionic Model | a) Quantitative technique |
| 2. Simulation | b) Physical Model |
| 3. Linear Programming | c) Reorder Level |
| 4. Demand during replenishment lead time | d) Economic Order Quantity |
| 5. EOQ | e) Technique to allocate resources in order to achieve some objective |
| 6. Order Cycle | f) Special Purpose Simulation Language |
| 7. GPSS | g) General purpose programming language |
| 8. COBOL | h) Time period between two successive replenishment |

Q. 4 Find True or False of the following

1. Decision variables are uncontrollable
2. The quantitative approach to decision analysis is a rotational approach
3. An equation is more restrictive than an inequality
4. Lead time is the amount of time between the placement of an order and the delivery of the order quantity
5. Customer population is one of the characteristic of any queuing system
6. The sudden failure among machines is only seen as progressive
7. If the probability of failure of an item increases with the increase in its life, then such failure is called progressive failure
8. Using simulation for queuing problem would be appropriate if the arrival rate follows a Poisson distribution.

Part B (Answer any 3) 16 x3 = 48 marks

- Q 5 a)** What are the different types of models used in Operations Research? Explain briefly the general methods for solving these OR models.
- b) What is linear programming? What are its major assumptions and limitations?

Q. 6

A firm makes two types of furniture: chairs and tables. The contribution to profit by each product is Rs 20 per chair and Rs 30 per table. Both products are to be processed on three machines M1, M2 and M3. The time required in hours by each product and total time available in hours per week on each machine are as follows:

Machine	Chair	Table	Available Time (hrs)
M1	3	3	36
M2	5	2	50
M3	2	6	60

How should the manufacturer schedule his production in order to maximize profit?

Q. 7 Calculate

- a) EOQ and
- b) Total Variable Cost for the following items:

Annual demand	= 500 units
Unit price	= Rs 20
Order cost	= Rs 16
Storage rate	= 2% per annum
Interest rate	= 12% per annum
Obsolescence rate	= 6% per annum

Q.8 a) What is Simulation? What are the various types of simulation?

- b) What are the various steps of simulation process?

Q. 9 a) What is queuing theory? Classify the various queuing models.

- b) Discuss the importance of replacement model

SECTION C

20 marks

Que 10

(Case Study)

A company has two grades of inspectors grade1 and grade2 who are to be assigned a quality control inspection. It is required at least 2000 pieces be inspected per 8-hour day. A grade1 inspector can check pieces at the rate of 40 per hour, with an accuracy of 97 percent. A grade 2 inspector checks at the rate of 30 pieces per hour with an accuracy of 95 percent.

The wage rate of grade1 inspector is Rs 5 per hour while that of grade2 inspector is Rs 4 per hour. An error made by an inspector cost Rs 3 to the company. There are only 9 grade 1 inspector and 11 grade2 inspector available in the company. The company wishes to assign work to the available inspectors so as to minimize the total cost of the inspection.

Formulate this problem as a LP model and solve it by using Graphical Method.
