



Post Graduate Diploma in Logistics Management

Paper 6

OPERATION RESEARCH AND QUANTITATIVE TECHNIQUES IN LOGISTICS

Date : 11.12.2011  
Time : 2.00 p.m. to 5.00 p.m.

Max Marks : 100  
Duration : 3 hours

Instructions :

- 1) Answer all questions in PART A
- 2) PART B : Attempt any three questions in (from Question no. 5 to 9)  
Question no. 10 is compulsory.

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**PART A**

- Q.1 Which of the following is correct** (1 mark each)
1. Decision variables are a) Controllable b) Uncontrollable c) Parameters d) all of the above
  2. Mathematical Model is example of a) Physical Model b) Symbolic Model c) Iconic Model d) Analogue Model
  3. Major assumptions of an LP model are a) Certainty b) Additivity c) Linearity d) All of the above
  4. One of the important reason for carrying inventory is to a) improve customer service b) get quality discount c) maintain operational capability d) all of the above
  5. If the unit cost rises, the optimal order quantity a) increases b) decreases c) either increases or decreases d) none of the above
  6. For achieving steady-state condition and for the analytical result to be valid, which of the following condition is required a)  $\lambda/\mu$  should be less than 1 b)  $\lambda/\mu$  should be equal to 1 c)  $\lambda/\mu$  should be greater than 1 d) None of the above
  7. Problem of replacement is felt when job performing units fall a) Gradually b) Suddenly c) Both Suddenly & Gradually d) None of the above
  8. Which of the following is not the special purpose simulation language a) GPSS b) SIMSCRIPT c) BASIC d) DYNAMO

**Q. 2 Fill in the blanks ( 1 mark each)**

1. Iconic Model is a category of ----- Model
2. Most of the constraints in the linear programming problem are expressed as -----
3. EOQ is known as Economic Order -----
4. In Queuing theory if the customers are served in the order of their arrival, then this is known as -----service discipline
5. Queue Length = (-----) + (The no of customers being served)
6. If the probability of failure of an item increases with the increase in its life then such a failure is called ----- failure
7. GPSS is General Purpose System -----
8. The time delay between placing an order and receipt of delivery is called -----

**Q. 3 Match the following ( one mark each)**

	Column A		Column B
a)	Physical Model	1	Optimal replenishment order size of inventory items
b)	DYNAMO	2	Demand during the replenishment lead
c)	EOQ	3	Verbal Model
d)	Reorder level	4	Symbol for reorder level
e)	Symbolic Model	5	Ionic Model
f)	ROL	6	$L = \mu / (\mu - \lambda)$
g)	Expected length of non-empty queue	7	General purpose programming language
h)	Pascal	8	Special purpose simulation language

**Q.4 Find True or False of the following ( one mark each)**

1. Symbolic models use symbols & functions to represents variables and their relationships for describing the properties of the system
2. Linear programming technique is not useful for improving the quality of decisions
3. Divisibility is not an assumption of an LP model
4. Any Optimization Model is an Analytical Model
5. DYNAMO is a computer programme that is capable of taking input in the form of set of equations describing the system.
6. Probability of no customer in the system or queue is equal to  $1 - (\lambda/\mu)$
7. Random Failure is one of the type of Gradual Failure
8. In time independent simulation it is not important to know exactly when the event is likely to occur

## Part B

- Q.5** a) Explain the methodology of operations research (16 marks)  
b) What are the applications of operations research?

- Q.6** A company manufacturing television & radio sets has four major departments: chassis, cabinet assembly and final testing.

The monthly capacities of these are as follows:

	Television		Radio
Chassis	1500	or	4500
Cabinet	1000	or	8000
Assembly	2000	or	4000
Testing	3000	or	9000

The contribution of a television set is Rs 500 and that of a radio set is Rs 250. Assume that the company can sell any quantity of either product. Formulate this problem as an LP model to determine the optimal combination of television and radio sets. ( 16 marks)

- Q.7** A) An automobile company has determined that 16 spare engine will result into a stock out risk of 15% while 20 will reduce the risk to 15% and 24 to 10%. If the lead time is 3 months and the average usage is 6 engines/month, what should be the reorder level to maintain 85% service level.

B) What are the reasons for carrying inventory? (16 marks)

- Q.8** A) In a car manufacturing plant, a loading crane takes exactly 10 minutes to load a car into a wagon and again comes back to the position to load another car. If the arrival of car is in a Poisson stream at an average rate is one after every 20 minutes, calculate the average waiting time of a car in the queue. (8 marks)

B) Explain the structure if a queuing system. (8 marks)

- Q.9** A) What are the various types of simulation?

B) What are the various steps of simulation process? ( 16 marks)

**Q.10**

**Part C**

**(Compulsory)**

**20 marks**

A leading XYZ automobile company manufactures 200 motor cycles /day. Depending upon the availability of raw materials and other conditions, the daily production has been varying from 196 motorcycles to 204 motor cycles , whose probability distribution is as given below:

Production/day	Probability
196	0.05
197	0.09
198	0.12
199	0.14
200	0.20
201	0.15
202	0.11
203	0.08
204	0.06

The motor cycle are transported in a specially designed three-storeyed lorry that can accommodate only 200 motor cycles. Using the following random numbers : 82,89,78,24,52,53,61,18,45,40,23,50,77,27,54,10. Simulate the process to find out

- a) The average number of motor cycles waiting in the factory?
- b) The average number of empty spaces on the lorry?

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