Exam. Code : 211004
Subject Code : 4298

M.Sc. (Mathematics) 4th Semester
OPERATIONS RESEARCH—II
Paper—MATH-588

Time Allowed—Three Hours] [Maximum Marks—100

Note :—Attempt **TEN** questions in all, selecting **TWO** questions from each unit. All questions carry equal marks.

UNIT—I

1. Describe the fundamental components of a queueing system.
2. State and prove the Markovian property of inter-arrival times.
3. Give a brief summary of the various types of queueing models.
4. Define the concept of busy period in queueing theory and obtain its distribution for the single server Markovian queueing model with infinite capacity.

UNIT—II

5. Explain (M/M/1) : (N/FIFO) system and solve it in steady state.
6. A supermarket has two girls ringing up sales at the counters. If the service time for each customer is exponential with mean 4 minutes, and if people arrive

in a Poisson fashion at the rate of 10 an hour, then :

(a) What is the probability of having to wait for service ?

(b) What is the expected percentage of idle time for each girl ?

(c) If a customer has to wait, find the expected length of his waiting time.

7. Describe (M/M/C) : (N/FIFO) system and state its important characteristics.

8. Two repairmen are attending five machines in a workshop. Each machine breaks down according to a Poisson distribution with mean 3 per hour. The repair time per machine is exponential with mean 15 minutes.

(a) Find the probability that the two repairmen are idle; that one repairman is idle.

(b) What is the expected number of idle machines not being served ?

UNIT—III

9. Explain clearly the various costs that are involved in inventory problems with suitable examples. How they are inter-related ?

10. Discuss the basic ideas involved in EOQ concept. Derive EOQ model for an inventory problem when shortages of costs are not allowed.

11. Describe the decision rules for a purchase inventory model, with two price breaks. Also extend the decision rules for any number of price breaks.

12. Discuss a deterministic inventory system with multiple items and limited floor space.

UNIT—IV

13. What is replacement problem ? Describe some important situations which makes the replacement of items necessary.

14. Discuss the replacement policy when maintenance cost increases with time and the money value changes with constant rate.

15. A research team is planned to raise to a strength of 50 chemists and then to remain at that level. The wastage of recruits depends on their length of service which is as follows :

Year	:	1	2	3	4	5
Total % who have left upon the end of year	:	5	36	56	63	68
Year	:	6	7	8	9	10
Total % who have left upon the end of year	:	73	79	87	97	100

What is the recruitment per year necessary to maintain the required strength ? There are 8 senior posts for which the length of service is the main criterion. What is the average length of service after which new entrant expects promotion to one of the posts ?

16. Explain how the theory of replacement is used in the group replacement of items that fail completely.

UNIT—V

17. What is simulation ? Discuss briefly. Why simulation is used for solving real-life problems ?

18. Explain with illustrations, how Monte-Carlo methods are useful in Operations Research.

19. A town contains six wards and they contain 170, 510, 640, 75, 250 and 960 houses respectively. Make a random selection of 8 houses using the table of random numbers. Explain the procedure adopted by you.

20. Describe the application of simulation to the problems of maintenance with an illustration.