[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6182 **G**

Unique Paper Code : 62367502

Name of the Paper : Queueing and Reliability Theory (DSE)

Name of the Course : **B.A. (Program) - Operational Research**

Semester : V

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **Five** Questions out of **Seven**.
3. **All** questions carry equal marks.

1. (a) What is queueing problem? Explain queueing system, transient and study state. (7)

   (b) Show that 'n' the number of arrivals in a queue in time t follows the Poisson distribution, stating the assumption clearly. (8)

P.T.O.

2. (a) State and prove the Markovian property of inter arrival times (i.e. of exponential distribution).

(7)

(b) Explain (M|M|1): (∞|FCFS) queueing model, derive and solve the difference equation in study state, of the model.

(8)

3. (a) A TV repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come in, and if the arrival of sets is approximately Poisson with the average rate of 10 per 8-hours day, what is repairman's expected idle time each day? Flow many jobs are ahead of the average set just brought it. (7)

(b) In the railway marshalling yard, goods train arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time (the time taken to hump a train) distribution is also exponential with an average of 36 minutes. Calculate the following :

1. The average number of trains in the queue.

II. The probability that the queue size exceeds 10.

If the input of trains increases to an average 33 per day, what will be change in (I) and (II)? (8)

4. (a) What arc stochastic processes, and how do they hold significance in real-life scenarios? (7)

(b) Define the terms "software" and "software reliability" and outline the procedure for calculating the mean time before failure (MTBF) for software in detail. (8)

5. (a) Explain the significance and characteristics of the hazard rate. Additionally, calculate the hazard rate for any two probability distributions. (7)

(b) Write a short note on Weibull distribution and exponential distribution and compare both distributions. (8)

6. (a) Derive the reliability function and MTBF for a parallel series system of order (m,n) when all components arc identical and have the same constant rate of failure. (7)

(b) Derive the reliability function and MTBF for an n-unit stand by system when all the components are identical and have exponential failure time with rate λ. (8)

7. (a) Describe a series and parallel systems. Also show that a parallel system has higher reliability then any one of its components. (7)

(b) Show that in each component in series system has higher reliability than the series system (8)