MIT Arts, Design and Technology University, Rajbaug, Pune MIT School of Engineering

B.TECH. (Computer Science and Engineering), T.Y.SEM-V

Probability and Queueing Theory

UNIT-IV ASSIGNMENT-IV

Q.1. Define the following terms

(i) Customer (ii) Queue (iii) Service Channel (iv) Queueing Process

Q.2. What is queueing problem? Explain some basic characteristics of a queuing system.

Q.3. What is Queueing problem?
Q.4. Explain briefly the main characteristics of queueing system.
Q.5. Explain queueing system and state some of the important distributions of arrival intervals and service times.
Q.6. What do you understand by a queue give some important applications of queueing theory.
Q.7. Define Transient state and steady state?
Q.8. Give a brief summary of the various types of queueing models?
Q.9. Define the concept of busy period i.e. traffic intensity in queueing theory?
Q.10. Explain important elements of queueing models?

Q.11. A bank customer window has a mean service time of 2 minutes and customers arrive at the rate of 20 per hour. Assume that these represent rates with a poison distribution :

(i)What percent of time will the counter be idle?

(ii)How long will it take the average customer to wait in line and be served?

Q.12. Explain briefly the main characteristics of queueing system.

Q.13. In a service department manned by one server, on an average one customer arrives every 10 minutes. it has been found out that each customer requires 6 minutes to be served. Find out

(i) Average time spent in the system

(ii) The probability that there would be two customers in the queue.

Q.14. A T.V. repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs set in the order in which they come in, and if the arrival sets is approximately poission with an average rate of 10 per 8 hour day, what is repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?

Q.15. Patients arrive at a clinic according to a poison distribution at the rate of 30 patients per hour. The waiting room does not accommodate more than 14 patients. Examination time per patient is exponential with mean rate 20 per hour;

(i) Find the affective rate at clinic.

(ii) What is the expected waiting time until a patient is discharged from the clinic?

Q.16. In a railway marshalling yard, goods train arrive at a rate of 30 trains per day. If the distribution of arrivals is a poison and that of service time is exponential with an average 36 minutes, then find

(i) The mean queue size

(ii) The probability that the queue size exceeds 10.

Q.17. Patients arrive at a clinic according to a poison distribution at the rate of 30 patients per hour. The waiting room does not accommodate more than 14 patients. Examination time per patient is exponential with mean rate 20 per hour;

(i) Find the affective rate at clinic.

(ii) What is the expected waiting time until a patient is discharged from the clinic?

Q.18. Explain (M/M/1): (N/Infinity/FCFS) queueing system and solve it in steady state.

Q.19. The XYZ company's quality control department is managed by a single clerk, who takes on an average 5 minutes in checking parts of each of the machine coming for inspection. The machine arrive once in every 8 minutes on the average. One hour of the machine is valued at Rs.15 and a clerk's time is valued at Rs.4 per hour. What are the average hourly queuing system costs associated with the quality control department?

Q.20. Arrivals at telephone booth are considered to be poison with an average time of 10 minutes between one arrival and the next. The length of phone call is assumed to be distributed exponentially with mean 3 minutes :

(i) What is the probability that a person arriving at the booth will have to wait?

(ii)What is the average length of the non-empty queues that form from time to time?

Q.21. A self-service store employs one cashier at its counter. An average of mine customers arrives every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service rate. Find

(i) Average number of customer in the system

(ii) Average Queue lengths

Q.22. If for a period of 2 hours in a day (8-10 am) trains arrive at the yard every 20 minutes but service time continues to remain 36 minutes then calculate for this period

(i) The probability that the yard is empty.
(ii) Average Queue length.

Q.23. An airlines organisation has one reservation clerk on duty in its local branch at any given time. The clerk handles information regarding passenger reservation and flight timings. Assume that the number of customers arriving during any given period is Poisson distributed with an arrival rate of eight per hour and that the reservation clerk can serve a customer in six minutes on an average, with an exponentially distributed service time,
(i) What is the probability that the system is busy?
(ii) What is the average time a customer spends in the system?
(iii)What is the average length of the queue and what is the number of customers in the system?

Q.24.A shipping company has a single unloading berth with ships arriving in poisson fashion at an average rate of three per day. The unloading time distribution for a ship with the unloading crews is found to be exponential with average unloading time ½ in days. The company has a large labour supply without regular working hours and to avoid long waiting lines the company has a policy of using as many unloading crews as there are ships waiting in line or being unloaded. Under these conditions, find

(i) The average number of unloading crews working at any time, and

(ii) The probability that more than four crews will be needed.