GALGOTIAS UNIVERSITY

ADMISSION NUMBER												

School of Basic Sciences

Master of Science in Mathematics
Mid Term Examination - Nov 2023

Duration : 90 Minutes
Max Marks : 50

Sem I - C1PM103T - Optimization Techniques

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1)	Explain traffic intensity for M/M/C system.	K2	(2)
2)	Consider a single server queuing system with Poisson input and exponential service times. Suppose the mean arrival rate is 3 calling units per hour, the expected service time is .25 hour. Find the traffic intensity of this system.	K1	(3)
3)	A super market has two sales girls at the sales counters. If the service time for each customer is exponential with a mean of 4 minutes, and if the people arrive in a Poisson fashion at the rate of 10 an hour, then estimate percentage of idle time for each sales girl.	K2	(4)
4)	What is line utilization factor? The capacity of a communication line is 2000 bits per second. This line is used to transmit eight- bit characters ,so the maximum rate is 250 characters per second. The application calls for traffic from many devices to be sent on the line with a total volume of 12000 characters per minute. Find the line utilization factor and estimate the average number of characters waiting to be transmitted .	K2	(6)
5)	Construct network diagram for following activities: A< B, C; B<D; B,C<E; E<F; D,F<G; G<H	K3	(6)
6)	A barber shop serves one customer at a time and provides three seats for waitingcustomers. If the place is full, customers go elsewhere.Arrivals occur according to a poisson distribution with mean 4 per hour.The time to get a haircut is exponential with mean 15 minutes.Determine the following: (a)The steady state probabilities.(b) The expected number of customers in the shop.	K3	(9)

7) A manufacturing company purchases 9000 part of a machine for its annual requirements ordering one month usage at a time.Each part costs Rs.20.The ordring cost per order is Rs.15 and the carrying charges are 15% of the avearage inventory per year.You have been assigned to suggest a more economical purchasing policy for the company.What advice would you offer and how much would it,save the company per year? K4 (8)

8) People arrive at a telephone booth according to a Poisson process at an average rate of 12 per hour, and the average time for each call is an exponential random variable with mean 2 minutes.(i) What is the probability that an arriving customer will find the telephone booth occupied?(ii) It is the policy of the telephone company to install additional booths if customers wait an average of 3 or more minutes for the phone. Analyse the system and find the average arrival rate needed to justify second booth. K4 (12)

OR

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. Analyse the system and answer the following: (a) Average queue length (b) Average time spent in the system (c) Probability that there would be two customers in the queue. K4 (12)