Solution of Assignment 3

Q1. In a single server queuing model, if arrival rate is λ and service time is μ, the probability of system being idle will be
(a) λ / μ
(b) μ / λ
(c) 1- (λ / μ)
(d) (1- λ) / μ

Q2. Which of the following probability distribution is most commonly used for number of arrivals in a given time in a single server queuing model
(a) Negative exponential distribution
(b) Poisson distribution
(c) Normal distribution
(a) Beta distribution

Q3. In a single server queuing system, if arrival rate is λ and service time is μ, then the expected number of customer in the system is
(a) $\lambda / (\mu - \lambda)$
(b) $\mu - \lambda$
(c) $1/ (\mu - \lambda)$
(d) $(\mu - \lambda) / \lambda$

Q4. Reneging means
(a) Customers leave when they see that the line is too long
(b) Customers leave after being in the line assuming that it is moving too slowly
(c) Customers move from one line to an another (shorter) line
(d) Customers permanently leave the line because they have no time

Q5. Server utilization factor is evaluated as
(a) (Total time available for the server) / (Total engage time of server)
(b) (Total time available for the server) - (Total engage time of server)
(c) (Total engage time of server) / (Total time available for the server)
(d) (Total engage time of server) + (Total time available for the server)

Q6. Jockeying means
(a) Customers leave when they see that the line is too long
(b) Customers leave after being in the line assuming that it is moving too slowly
(c) Customers move from one line to an another (shorter) line
(d) Customers permanently leave the line because they have no time

Q7. In queuing notation, A/B/C/N/K, B stands for
(a) Arrival rate
(b) Service rate
(c) System capacity
(d) Calling population size

Q8. If a system behavior is independent of initial conditions and the elapsed time, then the behavior of Queue is said to be
(a) Transient behavior of queue
(b) Unsteady behavior of queue
(c) Dynamic behavior of queue
(d) Steady state behavior of queue

Q9. A limit on the number of customers that may be in the waiting line or system is represented by
(a) System capacity

(b) Service rate
(c) Calling population
(d) Arrival rate

Q10. In which of the following, arrival rate is not affected by the number of customers who have left the calling population and joined the queue?
(a) System capacity
(b) Finite population model
(c) Balking
(d) **Infinite population model**

Q11. A T.V repairman finds that the time spend on his job has an exponential distribution with mean 30 minutes. If he repairs in the order in which they come in and if the arrival of set is approximately poission with an average rate of 10 per 8 hour day, the repair man's expected idle time each day is
(a) 5 hours
(b) 3 hours
(c) 4 hours
(d) 2 hours

Solution: λ = 10 per day
$\mu = (8 \times 60) / 30 = 16$ per day
ρ = busy factor = $(\lambda / \mu) \times 8 = (10/16) \times 8 = 5$ hours
Ideal time = 8-5 = 3 hours

Q12. If the arrivals at a service facility are distributed as per the poisson distribution with a mean rate of 10 per hour and the services are exponentially distributed with a mean service time of 4 minutes, what is the probability that a customer may have to wait to be served?
(a) 0.40
(b) 0.50
(c) 0.67
(d) 0.83

Solution: Arrival at a rate of 10/hour
$\lambda = 10$
Service is at the rate of 4 minutes interval
$\mu = 60 / 4 = 15$
$\rho = \lambda / \mu = 10/15 = 0.67$

Q13. At a work station, 5 jobs arrive every minute. The mean time spent on each job in the work Station is 1/8 minute. The mean steady state number of jobs in the system is
(a) 1.67
(b) 2.67
(c) 3.67
(d) 4.67

Solution: λ = arrival rate = 5 jobs/minute
μ = service rate = 8 jobs/ minute
The mean steady state number of jobs in the system = $L_s = \lambda / (\mu - \lambda) = 1.67$

Q14. Arrivals at a telephone booth are considered to be poisson, with an average time of 10 minutes between successive arrivals. The length of a phone call is distributed exponentially with mean 3 minutes. The probability that an arrival does not have to wait before service is
(a) 0.3
(b) 0.5
(c) 0.7
(d) 0.9

Solution: $\lambda = 0.1$ per min

$\mu = 0.33$ per min

$\rho = 0.1 / 0.33 = 0.3$

$P_0 = 1-\rho = 0.7$

Q15. Which of the following statement is/are correct for finite population model?

(i) Arrival rate depends on the number of customers being served and waiting

(ii) Customer is assumed pending when customer is outside the queuing system and is a Member of the potential calling population

(a) Only i
(b) Only ii
(c) Both i and ii
(d)None of these