

Class : II P.G
Major: Mathematics

Time:3 hrs
Max Marks 60

17MMAC14 – Queueing Theory

10X1/2 =5

Part -A

Choose the correct Answer

1.If a customer decides not to enter the queue upon arrival the customer is said to have-----

- a) balked b) reneged c) jockey d) none of these

2.If $f_{jj} < 1$ then j is a ----- state

- a) steady b) recurrence c) transient d) positive recurrent

3. The full steady state solution for M/M/1 system which is in geometric probability function, it's

p_n is given by -----

- a) $(1-\rho)\rho^n$ b) $(1-\rho)$ c) $(1-\rho)\rho$ d) $(1-\rho)n$

4.For M/M/1 model L_q is given by -----

- a) $\rho/(1-\rho)$ b) $(1-\rho)$ c) ρ d) $\rho/(1+\rho)$

5. For M/M/C/K model when $\rho = 1$, then p_n is given by

- a) $1/(K-1)$ b) $1/(K+1)$ c) $1/K$ d) $(K-1)$

6.The expected waiting length of the busy period for M/M/1 is given by-----

- a) $1/(\mu-\lambda)$ b) $1/(\mu+\lambda)$ c) $1/\mu$ d) $1/\lambda$

7.For $M/M^Y/1$ model L is given by-----

- a) $r_0 / (1-r_0)$ b) $1/ (1-r_0)$ c) $(1-r_0)$ d) $(1+r_0)$

8. L_q for $M/ E_k /1$ model is -----

- a) $(k+1)\rho^2 / k (1-\rho)$ b) $(k+1)\rho^2 / 2k (1-\rho)$
c) $(k+1)\rho / k (1-\rho)$ d) $(k+1)\rho / 2k (1-\rho)$

9. The average number of customers arriving during a service time for M/G/1 model is -----

- a) $\lambda E(s)$ b) $\lambda/E(s)$ c) $E(s)/\lambda$ d) $1/(1-\lambda E(s))$

10. For M/G/1 model $E(N(N-1))$ is given by -----

- a) $\lambda^2 w_2$ b) λw_2 c) $\lambda^2 w$ d) λw

Part B

5x4=20

ANSWER ALL QUESTIONS.

Each answer should not exceed 200 words or one page

11 a. Explain about queue discipline

(Or)

11.b. Derive the CDF of Poisson process

12.a. Explain imbedded Markov chain

(Or)

12.b. Discuss about discrete parameter Markov chain

13.a. Compute L_q , W_q , W and L for $M/M/C$ model

(Or)

13.b. Explain busy period analysis for $M/M/1$

14.a. Derive the mean queue length L_q for $M/M/C/K$ model

(Or)

14.b. Explain Erlang distribution

15.a. Prove that $\pi_n = p_n$

(Or)

15.b. Discuss the steady state solution for single server Poisson arrival queue in which customers are served in batches of fixed size K .

Part C

5X7=35

ANSWER ALL QUESTIONS.

Each answer should not exceed 600 words or three pages

16.a. Define Poisson postulates and show that the counting process following the Poisson postulates is a Poisson process

(Or)

16.b. Discuss the relation between Poisson exponential arrival process

17.a. Derive p_n and hence p_0 for steady state birth death process

(Or)

17.b. Solve steady state difference equations of $M/M/1$ model for p_n by generating function

18.a. Derive $W_q(t)$ and hence $W(t)$ for $M/M/C$ model

(Or)

18.b. Derive p_n and hence p_0 for $M/M/C/K$ model

19.a. Evaluate $P(z)$ and hence compute p_0 for $M^X/M/1$ model

(Or)

19.b. Derive the expected queue size L_q for $M/E_k/1$ model

20.a. State and prove P_n formulae for $M/G/1$ model

(Or)

20.b. Derive necessary and sufficient condition for the steady state when $\rho < 1$