Quality of Service Seminar 2



Date: Spring
Duration: 15 min.

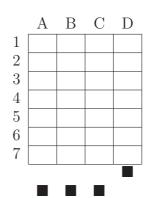
- There is only one correct answer for each multiple choice question.
- Each correct answer adds 1 point.
- Each incorrect answer has a penalty of $\frac{1}{3}$ points.
- No score is awarded for unanswered questions, neither positive nor negative.
- Mark out your answers with an "X".
- No score is awarded if you mark more than one answer.

Write your personal data clearly.

Last name:	
First name:	
Group:	

Permutation: A

NIA:



- 1.- What is the time that a data packet has to wait in the queue in a M/M/1 buffer? Note that the queueing time is different from the total sojourn time.
 - (a) $\frac{1-\rho}{(\rho+1)\lambda}$.
 - (b) $\frac{\mu}{\rho(1+\lambda)}$
 - (c) $\mu \rho^2$
 - (d) $\frac{\rho^2}{\lambda(1-\rho)}$
- 2.- Given a buffer that can accommodate k packets and receives a Poisson traffic load of $A = \frac{\lambda}{\mu}$ erlangs, what is the average number of packets in the buffer? (This number includes the packet that is currently being transmitted).
 - (a) $N = \frac{1-A}{(A+k)\lambda}$.
 - (b) $N = \lambda k = \sum_{i=A}^{\infty} k$.

 - (c) $N = p_0 \sum_{i=0}^{k} A^i$. (d) $N = \frac{A(1-A)}{1-A^{k+1}} \frac{\partial}{\partial A} \frac{1-A^{k+1}}{1-A}$.
- 3.- What is the average number of packets in a M/M/1 buffer?
 - (a) 42
 - (b) $\frac{\lambda}{2}$.
 - (c) $p_0 \sum_{i=0}^{\infty} i \rho^i$.
 - (d) $\lim_{N\to\infty} \lambda^{\rho}$.
- 4.- Consider two Poisson traffic sources that generate 0.8 packets/second each. To transmit this packets we have two different options, X and Y. Option X is to have two different transmitters (one for each flow) each one with a capacity equal to 1 packet/second and an exponentially distributed service time. The second option (option Y) is to merge the two flows in a single buffer and have a single transmitter of capacity 2 packets/second and exponentially distributed service time.
 - (a) Option X offers more throughput than option Y.
 - (b) Option X and option Y offer the same average delay.
 - (c) Option Y offeres twice as much throughput as option X.
 - (d) Option Y offers a lower average delay.
- 5.- Which is the probability of finding an M/M/1 buffer empty?
 - (a) $\frac{1}{\rho}$
 - (b) $\frac{-1}{\rho^2}$.
 - (c) 1ρ
 - (d) $\frac{1}{1-\rho}$.

- 6.- Which of the following is the balance equation that we use to solve a model for a buffer where the arrivals follow a Poisson process with parameter λ and the service time is exponential and the rate is μ . p_n is the probability of having n packets in the system.
 - (a) $p_n = \rho p_{n+1}$ for n = 0.
 - (b) $p_n p_{n+1} = \frac{\lambda}{\mu} \text{ for } n \ge 0.$ (c) $p_{n+1}\lambda = p_n\mu \text{ for } n \ge 0.$

 - (d) $\lambda p_n = \mu p_{n+1}$ for $n \ge 0$.
- 7.- What is the normalization equation that we use in the process of modelling an M/M/1system?
 - (a) $\sum_{i} \lambda = \sum_{i} \mu$.
 - (b) $\sum_{i=0}^{K} p_i = \infty.$
 - (c) $\lambda p_i = \sum_{i=\rho}^{\infty}$.
 - (d) $\sum_{i=0}^{\infty} p_i = 1$.