Quality of Service
Seminar 2

UNIVERSITAT POMPEU FABRA

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". Make sure that the "X" reaches the corners of the rectangle. ☒
- No score is awarded if you mark more than one answer.
- Pad your NIA with 0s on the left to complete the NIA field.

Write your personal data clearly.

Last name:	
First name:	
Group:	

Permutation: A

NIA: | | | | | | | | | |

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				

1.- 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) $N = \frac{A(1-A)}{1-A^{k+1}} \frac{\partial}{\partial A} \frac{1-A^{k+1}}{1-A}$.

(b) $N = p_0 \sum_{i=0}^{k} A^i$.

(c) $N = \lambda k = \sum_{i=A}^{\infty} k$.

(d) $N = \frac{1-A}{(A+k)\lambda}$.

2.- 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) $\frac{\rho^2}{\lambda(1-\rho)}$

(b) $\mu\rho^2$

(c) $\frac{1-\rho}{(\rho+1)\lambda}$.

(d) $\frac{\mu}{\rho(1+\lambda)}$.

3.- Consider two Poisson traffic sources that generate 0.8 packets/second each. To transmit these 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 Y offers a lower average delay.

(c) Option Y offeres twice as much throughput as option X.

(d) Option X and option Y offer the same average delay.

4.- What is the normalization equation that we use in the process of modelling an M/M/1 system?

(a) $\sum_i \lambda = \sum_i \mu$.

(b) $\lambda p_i = \sum_{i=\rho}^{\infty}$.

(c) $\sum_{i=0}^{K} p_i = \infty$.

(d) $\sum_{i=0}^{\infty} p_i = 1$.

5.- 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) $p_{n+1}\lambda = p_n\mu$ for $n \geq 0$.

(b) $p_n = \rho p_{n+1}$ for $n = 0$.

(c) $p_n - p_{n+1} = \frac{\lambda}{\mu}$ for $n \geq 0$.

(d) $\lambda p_n = \mu p_{n+1}$ for $n \geq 0$.

6.- What is the average number of packets in a M/M/1 buffer?

(a) $p_0 \sum_{i=0}^{\infty} i\rho^i$.

(b) $\frac{\lambda}{2}$.

(c) 42

(d) $\operatorname{lím}_{N\to\infty} \lambda^{\rho}$.

7.- Which is the probability of finding an M/M/1 buffer empty?

(a) $\frac{1}{1-\rho}$.

(b) $1-\rho$

(c) $\frac{1}{\rho}$

(d) $\frac{-1}{\rho^2}$.