UNIVERSITAT POMPEU FABRA

Quality of Service
degree

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.- What are the implications of the PASTA theorem?

(a) In a system with poisson packet arrivals, it is sufficient to check which is the system state at the moment of packet arrivals to derive time averages.

(b) Little's theorem can be generalized to systems with a Poisson arrival provess.

(c) It is the complementary result to the PESTO property.

(d) In a buffer with different priorities, the waiting time is the same for all the arriving packets that follow a Poisson distribution.

2.- What is the memoryless property of the exponential distribution? For an exponentially distributed random variable T ...

(a) $Pr(T > s + t|T > s) = Pr(T > s)$ for all $s, t \geq 0$.

(b) $Pr(T > s + t|T > s) = Pr(T > s + t)$ for all $s, t \geq 0$.

(c) $Pr(T > s + t|T < s) = Pr(T > s + t)$ for all $s, t \geq 0$.

(d) $Pr(T > s + t|T > s) = Pr(T > t)$ for all $s, t \geq 0$.

3.- What do we obtain if we merge two Poisson processes?

(a) Another Poisson process with a rate equal to the sum of the two original ones.

(b) An Erlang-2 process with a rate equal to the sum of the two original ones.

(c) An Erlang-2 process with a rate equal to the product of the two original ones.

(d) Another Poisson process with a rate equal to the product of the two original ones.

4.- Which of the following is the pdf of an exponential distribution with parameter λ?

(a) $f(x; k; \theta) = \frac{1}{\theta}\frac{1}{\Gamma(k)}x^{k-1}e^{-\frac{x}{\theta}}$

(b) $f(k; \lambda) = \frac{\lambda^k e^{-\lambda}}{k!}$.

(c) $F(x; \lambda) = \begin{cases} 1 - e^{-\lambda x} & x \geq 0 \\ 0 & x < 0 \end{cases}$.

(d) $f(x; \lambda) = \begin{cases} \lambda e^{-\lambda x} & x \geq 0 \\ 0 & x < 0 \end{cases}$.

5.- What is the distribution of the interarrival time for a Poisson process?

(a) Poisson

(b) Erlang-10

(c) Exponential

(d) Hyperexponential

6.- Imagine that bus interarrival time is exponentially distributed and the sign at the bus stop says that the probability that the bus arrives in the next 10 minutes is $\frac{1}{2}$. After waiting for 10 minutes, the bus has not arrived. Which is the probability that arrives in the next 10 minutes?

(a) $\frac{1}{3}$.

(b) $\frac{1}{2}$.

(c) 0.

(d) $\frac{1}{4}$.

7.- Imagine a packet network that accepts 1 packet per second, and all the packets are delivered (no packet loss occurs). If the average delay suffered by the packets is three seconds, which is the average number of packets in the network?

(a) More than one packet and less than three packets.

(b) Three packets.

(c) One packet.

(d) 0.33 packets.