

Software Testing & Risk Assessment Assignment 3

Problem 1: You are waiting for a package to arrive from the webshop Wish. People have figured out that, for this webshop, the delivery time X is exponentially distributed with parameter $\lambda=1/15$ days.

Questions

1. What is the expected amount you have to wait?
2. What is the probability that you wait
 - A. less than 5 days?
 - B. more than 10 days?
 - C. exactly 10 days?
 - D. between 10 and 25 days?
3. So far, you have been waiting for 15 days.
 - A. What is the probability that you have to wait less than 5 more days?
 - B. What is the probability that you have to wait more than 10 more days?
 - C. exactly 10 more days?
 - D. between 10 and 25 more days?

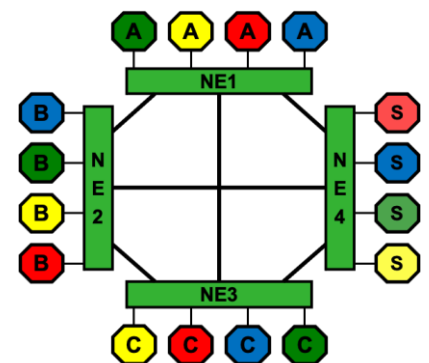
Hint: use that the exponential distribution is memoryless, i.e., $\mathbf{P}[X > t+t' \mid X > t'] = \mathbf{P}[X > t]$.

Problem 2:

1. In the lecture, you have been told that the exponential probability distribution is memoryless, i.e., that $\mathbf{P}[X > t+t' \mid X > t'] = \mathbf{P}[X > t]$. Prove this. *Hint:* recall that the conditional probability of an event A given an event B is given by $\mathbf{P}[A|B] = \mathbf{P}[A \cap B]/\mathbf{P}[B]$.
2. **For those of you with a background in calculus:* In the lecture, you have been told that the expected value of an exponentially distributed random variable with parameter λ is equal to $1/\lambda$. Prove this. *Hint:* recall that the expected value of a continuous random variable with cumulative density function P is equal to $\int_0^{\infty} P'(x)x dx$, where P' is the derivative of P .

Problem 3 (Homework). Consider a fault tolerant system, as in the figure below.

- There are 4 types of processors *red, blue, yellow and green*
- There are 4 processors of each type, A, B, C, and S, where S acts as a spare.
- The processors are connected via 4 network elements (NE), where each network element connects 4 processors, being one processor of each type
- If the network element fails, then all processors connected to it fail as well.
- All network elements and non-spare processors are running from the start.



Requirements

- For the system to be up, there must be at least 2 processors available for each type, as well as their associated network elements.

Construct a dynamic fault tree for this system.