SSE 2300/CE4990

Test Preparation

April 5, 2010

Who wants to wait??

Ms. Cutt runs a one person tax consultant firm. She does not make appointments, but runs her service on a first come, first serve basis. She finds that she is extremely busy during March and April, so she is considering hiring a part time assistant or even possibly increasing the size of her facility. Having obtained a degree in SSE from Michigan Tech in her spare time, prior to embarking upon her career, she elects to analyze the system carefully before making a decision.

She notices that on any given day during March or April, customers arrive according to a Poisson process and the mean arrival rate is 5 per hour. Because of her excellent reputation customers are usually willing to wait. The data further showed that the customer processing time is 10 minutes. Help her answer the following questions (Many years of tax law has resulted in her forgetting most of her SSE knowledge!).

- Average number of customers in the shop
- Average number of customers waiting for service
- Average time customers spend in the system and
- Average time customers spend waiting.
- Average number waiting when there is at least one person waiting
- Percentage of time that an arrival can walk right in without having to wait
- Ms. Cut's facility currently only has four seats. She wants to know the probability that a customer upon arrival will not be able to find a seat

What would you suggest?

Repairman Problem Application

A component of a computer has an active life, measured in discrete units, presented by a random variable ϵ, where:

$$\begin{array}{rcccc} k = & 1 & 2 & 3 & 4 \\ Pr\{\epsilon = k\} = & 0.1 & 0.3 & 0.2 & 0.4 \end{array}$$

Suppose one starts with a fresh component and each component is replaced by a new component upon failure. Let X_n be the remaining life of the component in service at the end of period n. When $X_n = 0$, a new item is placed into service at the start of the next period.

- Set up the transition probability matrix for $\{X_n\}$
- Solve for the limiting distribution
- Determine the probability that the item in service at the end of a period has no remaining life and will be replaced.
- Advise on a replacement policy