CSE 505 Problem Set 7

Date: Friday, December 19th, 2003
Due date: Friday, December 26th, 2003

- **Problem 1**

Mr. Mean Variance has the only key which locks or unlocks the door to Building 59, the Probability Building. He visits the door once each hour, on the hour. When he arrives:

If the door is open, he locks it with probability 0.3.

If the door is locked, he unlocks it with probability 0.8.

a. After he has been on the job several months, is he more likely to lock the door or to unlock it on a randomly selected visit?

b. With the process in the steady state, Joe arrived at Building 59 two hours ahead of Harry. What is the probability that each of them found the door in the same condition?

c. Given the door was open at the time Mr. Variance was hired, determine the z transform for the number of visits up to and including the one on which he unlocked the door himself for the first time.

- **Problem 2**

At a single service facility, the interarrival times between successive customers are independent exponentially distributed random variables. The average customer arrival rate is 40 customers per hour.

When a total of two or fewer customers are present, a single attendant operates the facility and the service time for each customer is an exponentially distributed random variable with a mean value of two minutes.

Whenever there are three or more customers at the facility, the attendant is joined by an assistant. In this case, the service time is an exponentially distributed random variable with a mean value of one minute.

Assume the process is in the steady state.

a. What fraction of the time are both of them free?

b. What is the probability that both men are working at the facility the instant before a randomly selected customer arrives? The instant after he arrives?

c. Each of the men is to receive a salary proportional to the expected value of the amount of the time he is actually at work servicing customers. The constant of proportionality is the same for both men, and the sum of their salaries is to be \$100. Determine the salary of each man.