ECES 798 Performance Evaluation
Exam 1
Time: 1 hr 15 min
Total Points: 35

Name:

1. Suppose, we start a discrete event simulation by scheduling a single event in the future event list (FEL) with timestamp 0, and the simulation is such that *each* event in the simulation **schedule**s *exactly* one other event. How many events will there be in the FEL after the first *k* events have been **cause**d and executed and the program is about to **cause** the next event.

[5]

Now solve the same problem, but when each event in the simulation schedules exactly *i* events ($i > 0$).

[5]

2. State one drawback of using arithmetic mean of ratios of execution times for summarizing performance of several computer systems on a number of benchmark programs. [5]

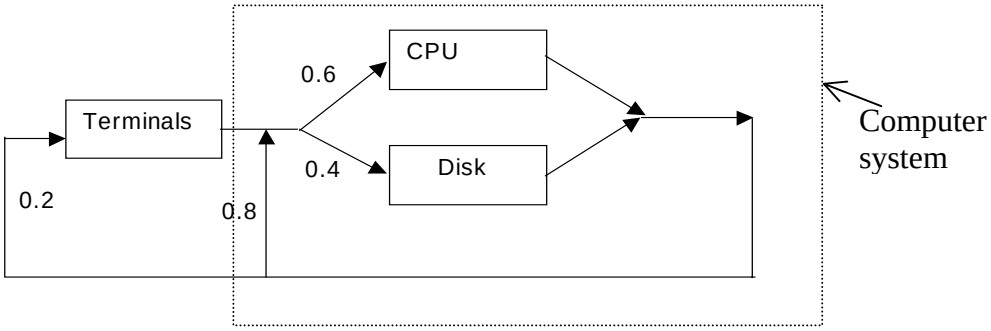
3. Consider the interactive computer system model shown in the following diagram. The labels on the links are probabilities. There are 10 terminals. The following parameters are obtained via measurements:

   Terminal Average think time = 1.00 sec.

   CPU Average service time = 50 ms.
   Average response time = 233 ms.

   Disk Average service time = 100 ms.
   Average response time = 400 ms.

   The above times are *for each pass* through CPU or Disk. Note that a job may make multiple passes. The probabilities at each fork points are as shown.



   [Helpful hint: The distribution of the number of trials up to and including the first success in a sequence of *Bernoulli* trials is modeled by a geometric distribution. If *p* is the probability of success, the mean of the distribution is *1/p*.]

   Compute the visit ratios for the CPU and disk. [4]

   Compute the average response time for the computer system. [4]

Compute the total throughput in jobs completed by the computer system per sec. [3]

What is the average number of jobs in the computer system? [3]

Carry out a bottleneck analysis to determine the asymptotic bounds of the response time vs. no. of terminals curve. What is value of no. of terminals at the knee (i.e., value of N*)? [6]