ECE 673/CA770A: Homework 7

Due:
May 10 (On-Campus Students);
One week after watching Lecture 22 (Off-campus students).

(1) You have a system consisting of 10 servers and 20 terminals. The service time at server $S_i$ is exponentially distributed with parameter $i\mu$ where $\mu = 1 \text{ sec}^{-1}$. After service at any given server, there is a probability of 0.2 of returning to the terminal and of 0.08 of being routed to server $i$, $i = 1, 2, \cdots, 10$. The think time at the terminal has a mean of 10 seconds. Use the Mean Value algorithm to calculate the average number of jobs and average response time at each server.

Now, try using the Schweitzer approximation to solve the same problem.

(2) A RAID-3 disk system operates by having $D$ data disks and one parity disk. If a single disk fails, it can be reconstructed using the other disks. If a second failure occurs before the first has been recovered from, we have system failure involving data loss.

Assume that disk failures occur independently according to a Poisson process with rate $\lambda$. Disk repair takes a duration that is uniformly distributed over the interval $[u_1, u_2]$.

Find the mean time to data loss. A good approximation is sufficient. You can assume that $1/\lambda \gg u_2$, if that helps.