COMP SCI/SFWR ENG 4/6E03 — Assignment 10

Do one of the following two questions:

1. Consider a system with five servers, where the arrivals follow a Poisson process with rate five per minute. Processing times at each server are exponentially distributed with rate 1.05 per minute. Each server uses FCFS.

   (a) Compare the performance of JSQ, RR, and Random routing. You should use analytic models or simulation, as appropriate.

   (b) Repeat your experiments if the processing times are constant with value 1/1.05 minutes. Comment on any differences to your results in (a).

2. Suppose that processing times in an M/G/1 queue are (units are seconds):

$$\begin{aligned} P\{X = 1000\} &= 0.5 \times 10^{-3} \\ P\{X = 0.5\} &= 1 - 0.5 \times 10^{-3} \end{aligned}$$

   (a) Use an analytic formula to calculate the expected number of jobs in the system if the arrival rate is $\lambda = 50$ jobs per minute.

   (b) Construct a simulation of the M/G/1 system. How long do you need to run the simulation to get reasonable results?

   (c) Now, switch to an M/M/1 with the same rates as above. Does your simulation need to run longer or shorter? By how much?