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

1. (a) You can run the given CSIM code and you should see that in terms of response time, JSQ is about a factor of two better than RR, and a factor of three better than random routing. Note that there was no need to run a simulation for random routing, as I could have used M/M/1 models to get exact numbers for these scenarios. The other two, we do not have analytic results for.

   (b) Changing the code in the appropriate manner, we see that RR actually outperforms JSQ. This may be a surprise, but one can show RR is the best possible policy here. The problem with JSQ is that when there are ties in the queue lengths, the algorithm provided will not necessarily send the job to the server that will empty soonest (as RR does). Things would be better if I wrote the code so that ties were broken randomly, but still not as good as RR.

2. (a) Using the Pollaczek-Khinchine formula, the expected number in system is approximately 1040.

   (b) In this case, the simulation crashes before the mean number in (a) is even reached, as CSIM has a limit on the number of processes at any point in time.

   (c) Trivially, the M/M/1 system runs faster (there is no issue with the simulation crashing).

   Note that there is a command in CSIM that allows one to increase the maximum number of processes (see the documentation). If one does this to a sufficiently high level that the M/G/1 system can run without crashing, it takes approximately 25 times as long to run the M/G/1 system to get a 95 percent confidence interval that has width 10 percent of the mean.