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

1. A simplified game server is modelled as follows. Players arrive to the server according to a Poisson process with rate of one every 2 minutes. Arrivals wait until three players have arrived, at which point the game immediately starts. The game takes an exponentially distributed period of time with mean 20 minutes. When the game is complete, all of the players leave the system. This infinitely repeats, i.e. another game is started after three more players arrive. Potential players that arrive when a game is in progress leave without waiting.

   (a) Calculate the steady-state probability that a game is being played.

   (b) Suppose that we add room so that one player can wait for the next game while the current game is in progress (three players are still required for a game). What is the steady-state probability that a game is being played?

2. The average response time for a database system is measured to be three seconds. During a one minute observation interval, the idle time on the system was measured to be 10 seconds. Using an M/M/1 model, determine the mean processing time per query.

3. A designer is trying to decide how many processors to have in a system. Each processor works at a rate of 100 jobs per hour and the system is such that a processor upon becoming idle chooses the next waiting job. The system is being designed for an arrival rate of 150 jobs per hour. Assume all underlying distributions (interarrival and processing times) are exponential. If the design criterion is that the probability that an arriving job has to wait is no larger than .5, what is the smallest number of processors that can be chosen?

4. Arriving jobs occur to a system according to a Poisson process with rate 40 per hour. Each job spends an exponentially distributed period of time in the system, with mean 30 minutes, independent of any other quantities. What is the expected number of jobs in the system?