# ISyE 3232A&B - Fall 2013

## Homework 5

Due at the beginning of class on Thursday Sept. 26 / Friday Sept. 27

1. Consider problem #1 of Homework 4. Now we will assume that the demand is governed by a continuous uniform distribution varying between 500 and 800 liters. The ordering cost is \$1,500 when an order is placed. What is the optimal ordering policy for arbitrary initial inventory level $x$?

2. A production line has two machines, Machine A and Machine B, that are arranged in series. Each job needs to processed by Machine A first. Once it finishes the processing by Machine A, it moves to the next station, to be processed by Machine B. Once it finishes the processing by Machine B, it leaves the production line. Each machine can process one job at a time. An arriving job that finds the machine busy waits in a buffer. (The buffer sizes are assumed to be infinite.) The processing times for Machine A are iid having exponential distribution with mean 4 minutes. The processing times for Machine B are iid with mean 2 minutes. Assume that the interarrival times of jobs arriving at the production line are iid, having exponential distribution with mean of 5 minutes.

   (a) What is the utilization of Machine A? What is the utilization of Machine B?

   (b) What is the throughput of the production system?

   (c) What is the average waiting time at Machine A, excluding the service time?

   (d) What is the long-run average number of jobs in the entire production line?

   (e) Suppose that the mean interarrival time is changed to 1 minute. What are the utilizations for Machine A and Machine B, respectively? What is the throughput of the production system?

3. The arrival rate of customers to an ATM machine is 30 per hour with exponentially distributed interarrival times. The transaction times of two customers are independent and identically distributed. Each transaction time (in minutes) is distributed according to the following p.d.f.:

$$f(s) = \begin{cases} 4\lambda^2 s e^{-2\lambda s} & \text{for } s \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

   where $\lambda = 2/3$.

   (a) What is the average waiting for each customer?

   (b) What is the average number of customers waiting in line?

   (c) What is the average number of customers at the site?