IS 604 Assignment 6

David Stern

November 12, 2015

## 6.1

A tool crib has exponential interarrival and service times and servers a very large group of mechanics. The mean time between arrivals is 4 minutes. It takes 3 minutes on the average for a tool-crib attendant to service a mechanic. The attendant is paid $10 per hour and the mechanic is paid $15 per hour. Would it be advisable to have a second tool-crib attendant?

To answer this question, we must compare the costs of each scenario. Hiring the attendants costs $10/hour/server. The costs of the mechanics waiting in line is less straight-forward. With an arrival rate of mechanics per hour, the average cost per hour is: .

For an queue, .

The cost per hour of having one server is:

For an queue, , where:

For , we can work backwards to get :

The cost per hour of having two servers is:

It appears that the cost of having two servers exceeds the cost of one. It would not be advisable to hire a second tool-crib attendant.

## 6.2

A two-runway (one runway for landing, one runway for taking off) airport is being designed for propeller-driven aircraft. The time to land an airplane is known to be exponentially distributed, with a mean of 1.5 minutes. If airplane arrivals are assumed to occur at random, what arrival rate can be tolerated if the average wait in the sky is not to exceed 3 minutes?

For this problem, we are only modeling the landing process, so with one runway, we will use the steady-state parameters of the queue. The average wait for this queue is:

If the average wait is not to exceed three minutes, then we find the maximum at .

The maximum arrival rate is , or one arrival every 2.25 minutes.