

Assignment #1

ECE 686 (Wireless Communication Networks)

Dr. Hai Jiang

Electrical and Computer Engineering, University of Alberta

Your Last name: Yari Your First Name: Amirhosein Your ID: 1834761

1. Consider an M/M/1 system. The average inter-arrival time is 20 minutes, and the average service time of a customer is 15 minutes. What is the probability of the system having an empty queue? For a customer, please calculate the average queueing time. **(6 points)**
2. Consider the M/M/m/m system discussed in the last three pages of our Lecture 2. There are $m=2$ servers. The arrival rate to the system is 15 per hour, while the service rate of each server is 12 per hour. For a server, what is the probability of the server being idle? **(5 points)**
3. Consider a router in a network. Packet arrivals to the router follow a Poisson process with average arrival rate being 1000 packets per second. The router has a processing unit, which processes packets (i.e., the processing unit transmits the packets to other routers). The processing time of a packet is a random variable following an exponential distribution with mean value 0.0008 second. The buffer of the router can store 5 packets (not including the packet being processed by the processing unit of the router). When a new packet arrives, if the buffer is full, then the new packet will be dropped by the router. Please calculate packet dropping probability at the router. **(5 points)**