CE 361

In-Class Design Problem #5
Queuing

Name_____

For this exercise, you are to compute queuing-related parameters for the following two problems:

1. A four-lane highway (two lanes in each direction) has a northbound capacity of 4400 veh/h. There are 4000 people per hour going in the northbound direction. They are all in your car (the car you designed in the first design problem) which is filled to capacity. An incident on the highway closes the highway (flow is 0 veh/h) for 10 minutes. The highway then is partially opened with a capacity of 1000 veh/h for another 20 minutes. After this time full capacity is restored (4400 veh/h). Assuming *D*/*D*/1 queuing, determine:

   a) the time until queue dissipation (after the start of the incident),
   b) total vehicle delay,
   c) average delay per vehicle,
   c) longest queue in vehicles, and
   d) longest delay of any vehicle (assuming FIFO).

2. A new computer system is put in place at a toll booth. The system comes online at 9:00 a.m. (with no vehicles in the queue) and vehicles arrive at a rate of $\lambda(t) = 12 - 0.4t$ (with $\lambda(t)$ in veh/min and t in min). Due to a computer system failure, cars are not serviced until 9:10 a.m. Between 9:10 a.m. and 9:20 a.m. they are serviced at 3 veh/min. After 9:20 a.m. they are serviced at 15 veh/min. Assuming *D*/*D*/1 queuing, determine the:

   a) the total vehicle delay in veh-min,
   b) longest queue in vehicles,
   c) longest delay of any vehicle (assuming FIFO).