Indian Institute of Technology Bombay

Department of Electrical Engineering

Handout 18 EE 706 Communication Networks

Assignment 4 : **30 points** **Due date**: March 22, 2010

Please write up your solutions in detail. Solutions missing explanations or crucial steps will not get full credit.

1. What can you say about the following queueing systems which have been codified in Kendall's notation? [10 points]

   (a) $M/M/2$

   (b) $M/M/2/2$

   (c) $M/M/2/2/2$

   (d) $G/G/2$

   (e) $D/D/2$

2. An $M/M/1$ queueing system has arrival rate equal to 10 customers per second and service rate equal to 11 customers per second. [10 points]

   (a) What is the average number of customers in the system?

   (b) What is the average time spent by a customer in the system?

   (c) What is the average time spent by a customer waiting in the queue?

   (d) What is the average number of customers in the queue?

3. A queueing system has customers arriving according to a Poisson process with interarrival times which are independent and exponentially distributed with rate 10 customers per second. The service times of each customer are independent and identically distributed according to a uniform distribution between 0 and 100 milliseconds. [10 points]

   (a) What is the average number of customers in the system?

   (b) What is the average time spent by a customer in the system?

   (c) What is the average time spent by a customer waiting in the queue?

   (d) What is the average number of customers in the queue?