Winter 2010 SYSC 5201 Midterm

90 Minutes
Close book

1. (30%) Provide simple and straight answers to the following questions.
   a. What is the main challenge in network edge?
   b. What is the main disadvantage of radio media?
   c. What is Little's Law?
   d. What are the main differences between client and server?
   e. Which factors affect the transmission delay of a packet?
   f. Which factors affect propagation delay?
   g. What is the main difference between persistent and non-persistent HTTP?
   h. How does a distributed peer-to-peer architecture keep and access index information?
   i. What is the main difference between SMTP and POP3?
   j. What is a socket?

2. (30%) Consider a network with three packet switches. Packets arrive at switches 1, 2, 3 in accordance with Poisson processes having respective rates 5, 10, 15. The transmission times at the three switches are exponential with respective rates 10, 50, 100. A packet completing service at switch 1 is equally likely to either (a) go to switch 2, (b) go to switch 3, or (c) leave the system. A packet departing at switch 2 always go to switch 3. A departure packet from switch 3 is equally likely to either go to switch 2 or leave the system. Ignore propagation and processing delays.
   a. What is the average number of packets in the network (consisting of all three switches)?
   b. What is the average time a packet spends in the network?
   c. What is the probability that there are more than 4 packets in switch 1?

3. (40%) Consider distributing a file of F bits to N peers using a P2P architecture. Assume a fluid model. For simplicity assume that d_{min} is very large, so that peer download bandwidth is never a bottleneck. Suppose that $u_s \leq (u_s + u_1 + \cdots + u_n)/N$. Specify a distribution scheme that has a distribution time of F/u_s.