CMPT 371, Spring 2006 Final Exam

1. (20 pts) Consider the leaky bucket scheme that polices the average rate and burst size of a packet flow. We now want to police the peak rate, \( p \), as well. Show how to combine two leaky bucket policers in series to police the average rate, peak rate, and burst size. Be sure to give the bucket size and token generation rate for both buckets.

2. (15 + 10 pts.) a. Consider a version of slotted ALOHA as follows. Assume each frame consists of \( L \) bits and there is a common channel of bandwidth \( R \) bits/second. Each slot is of size \( L/2R \) seconds. Would you expect the efficiency of this to be better or worse than the slotted ALOHA that we discussed in class? How about regular ALOHA? Give a justification for your answer, as formally as possible.

b. Suppose nodes \( A \) and \( B \) are on the same 10Mbps Ethernet segment and the propagation delay between them is 225 bit times. Suppose that they send frames at time \( t = 0 \) which obviously collide. Then they pick two \( K \) values, \( K_A = 0 \) and \( K_B = 1 \). Assuming no other nodes are active, can the two transmissions collide?

3. (20 + 10 pts) a. What is reverse path forwarding? Why is it desirable for multicast? Give an example network where the tree obtained by reverse path forwarding has cost twice that of the shortest paths tree.

b. Explain in one sentence (I will not read past the first 20 words) why split horizon with poisonous reverse prevents counting to infinity in a network with a tree topology running a distance vector algorithm.

4. (15 pts) Consider setting 1: two channels, each with capacity 70 MSS (the correct unit is MSS/RTT but don’t worry) and Setting 2: one channel with capacity 140 MSS. We have a large chunk of data. Under which setting will we send it faster? Assume that, if we send more packets than the capacity all at once, none of the batch sent will go through and we will have a packet loss which will be a timeout, leading to slow start. Initially the threshold in Setting 1 is 65, Setting 2 is 130. You might want to try for a number of time periods, write down any assumptions you make.

5. (10 pts) Which of [smtp, pop3, imap, http] are interchangeable (ie, they will perform the same function, assuming the machines understand all protocols)? For each group, mention for what task they are interchangeable.