# CIS 457 Data Communication: Homework 3

The following are selected from the end of Chapter 3 problem set beginning at page 284 of the textbook. The problem numbers are shown in the parentheses. Total points 38.

1. (3 points) (R8) Suppose that a Web server runs in Host C on port 80. Suppose this Web server uses persistent connections, and is currently receiving requests from two different Hosts, A and B. Are all the HTTP requests being sent through the same socket at Host C? If they are being passed through different sockets, do both of the sockets have port 80? Discuss and explain.

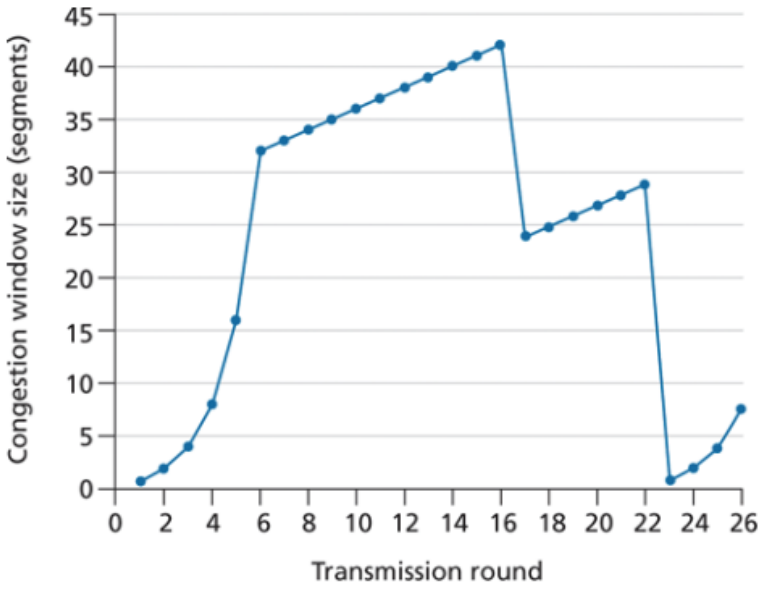
2. (R12) Visit the Go-Back-N interactive animation at the companion Website.
   (a) (2 points) Have the source send five packets, and then pause the animation before any of the five packets reach the destination. Then kill the first packet and resume the animation. Describe what happens.
   (b) (2 points) Repeat the experiment, but now let the first packet reach the destination and kill the first acknowledgment. Describe again what happens.
   (c) (2 points) Finally, try sending six packets. What happens?

3. (3 points) (P15) Consider the cross-country example shown in Figure 3.17.(Also read the calculations shown on page 213). Suppose that the size of a packet is 1,500 bytes, including both header fields and data. How big would the window size have to be for the channel utilization to be greater than 98 percent? Be sure to specify the unit of your answer (either "packets" or "bytes").

4. (P26) Consider transferring an enormous file of size $L$ bytes from host A to B. Assume an MSS of 536 bytes,.
   (a) (3 points) What is the maximum value of $L$ such that TCP sequence numbers are not exhausted? Recall that the TCP sequence number field has 4 bytes
   (b) (3 points) For the $L$ you obtain in (a), find how long it takes to transmit the file. Assume that a total of 66 bytes of transport, network, and data-link header are added to each segment before the resulting packet is sent out over a 155 Mbps link

5. (P40) Consider Figure 3.61 (from textbook). Assuming TCP Reno is the protocol experiencing the behavior shown above, answer the following questions. In all cases, you should **provide a short discussion** justifying your answer.

**Figure 3.61 TCP window size as a function of time**




(a) (2 points) Identify the intervals of time when TCP slow start is operating.

(b) (2 points) Identify the intervals of time when TCP congestion avoidance is operating.

(c) (1 point) After the 16th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?

(d) (1 point) After the 22nd transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?

(e) (2 points) What is the initial value of `ssthresh` at the first transmission round?

(f) (2 points) What is the value of ssthresh at the 18th transmission round?

(g) (2 points) What is the value of ssthresh at the 24th transmission round?

(h) (3 points) During what transmission round is the 70th segment sent?

(i) Assuming a packet loss is detected after the 26th round by the receipt of a triple duplicate ACK, what will be the values of the congestion window size and of ssthresh?

Warning: the graph provided above is for TCP Reno. You may have to rework the graph before answering the following questions about TCP Tahoe.

(j) (2 points) Suppose TCP Tahoe is used (instead of TCP Reno), and assume that triple duplicate ACKs are received at the 16th round. What are the ssthresh and the congestion window size at the 19th round?

(k) (3 points) Again suppose TCP Tahoe is used, and there is a timeout event at 22nd round. How many packets have been sent out from 17th round till 22nd round, inclusive?