Homework3 Solutions

1.

a. Let W denote the max window size measured in segments.
Then, W*MSS/RTT = 10Mbps, as packets will be dropped if the maximum sending rate exceeds link capacity.
Thus, we have W*1500*8/0.15=10*10^6, then W is about 125 segments.   10 points

b. As congestion window size varies from W/2 to W, then the average window size is 0.75W=94 (ceiling of 93.75) segments. Average throughput is 94*1500*8/0.15 =7.52Mbps.   10 points

c. 94/2 *0.15 = 7.05 seconds, as the number of RTTs (that this TCP connections needs in order to increase its window size from W/2 to W) is given by W/2. Recall the window size increases by one in each RTT.   10 points

2. Refer to Figure 5. In Figure 5(a), the ratio of the linear decrease on loss between connection 1 and connection 2 is the same - as ratio of the linear increases: unity. In this case, the throughputs never move off of the AB line segment.
In Figure 5(b), the ratio of the linear decrease on loss between connection 1 and connection 2 is 2:1. That is, whenever there is a loss, connection 1 decreases its window by twice the amount of connection 2. We see that eventually, after enough losses, and subsequent increases, that connection 1's throughput will go to 0, and the full link bandwidth will be allocated to connection 2.
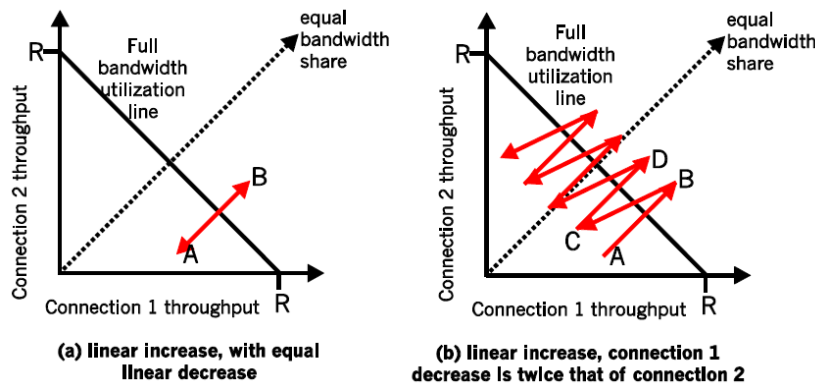

Figure 5: Lack of TCP convergence with linear increase, linear decrease

                      30 points

3.

a. No, you can only transmit one packet at a time over a shared bus.   5 points

b. Yes, as discussed in the text, as long as the two packets use different input busses and different output busses, they can be forwarded in parallel.   5 points

c. No, in this case the two packets would have to be sent over the same output bus at the same time, which is not possible.   5 points

a.

Prefix Match Link	Interface
11100000 00	0
11100000 01000000	1
1110000	2
11100001 1	3
Otherwise	3

15 points

b. Prefix match for first address is 5th entry: link interface 3
   Prefix match for second address is 3nd entry: link interface 2
   Prefix match for third address is 4th entry: link interface 3   10 points