You have 15 minutes to complete this quiz.

Name:　Grading Key

RIT Username:

Problem	Possible	Score
1	10	
2	15	
3	10	
Total	35	

1. Suppose that we design a variant of TCP that uses MIAD (multiplicative increase, additive decrease) as the congestion control mechanism for updating the congestion window. What would happen if two of our TCP flows compete at a bottleneck router? (10 pts)

The flow with the initially higher bandwidth will get all of the bandwidth, and the other flow will get none.

2a. Recall that TCP has two phases: *slow start* and *congestion avoidance*. What is the primary purpose of the slow start phase? (5 pts)

Slow start is used to determine the "base level" of bandwidth (i.e., to quickly determine if the bandwidth is on the order of Kb/s or Gb/s).

2b. Recall that TCP uses timeouts to determine if a packet has been lost (meaning if the ACK for a packet does not arrive within a specific period of time, the packet is consider to be lost). However, this requires the sender to wait for a long period of time to detect if the packet is indeed lost. It would seem that TCP could use negative-acknowledgements (NACKs), where a receive would proactively notify the sender with a NACK message if the packet was not received. Why do you think the designers of TCP chose not to use NACKs? (10 pts)

Packet losses are primarily due to congestion. If NACKs are used, they are likely to exacerbate the problem of congestion, leading to protocol instability. Not to mention additional complexity, etc.

3a. Recall that we discussed two TCP variants in class: TCP Tahoe and TCP Reno. However, in practice, most machines use TCP Reno. What is the primary reason why people have moved away from TCP Tahoe? (5 pts)

To avoid going back into slow start every time a packet is lost.

3b. What sequence of events would lead to TCP Reno *re-entering* the slow start phase after being in the congestion avoidance phase? Give a concrete example. (5 pts)

If a timeout truly occurs (i.e., not three duplicate acks), TCP Reno will re-enter slow start. This can happen if the network temporarily becomes unreachable.