

King Fahd University of Petroleum and Minerals  
College of Computer Sciences and Engineering  
Department of Computer Engineering

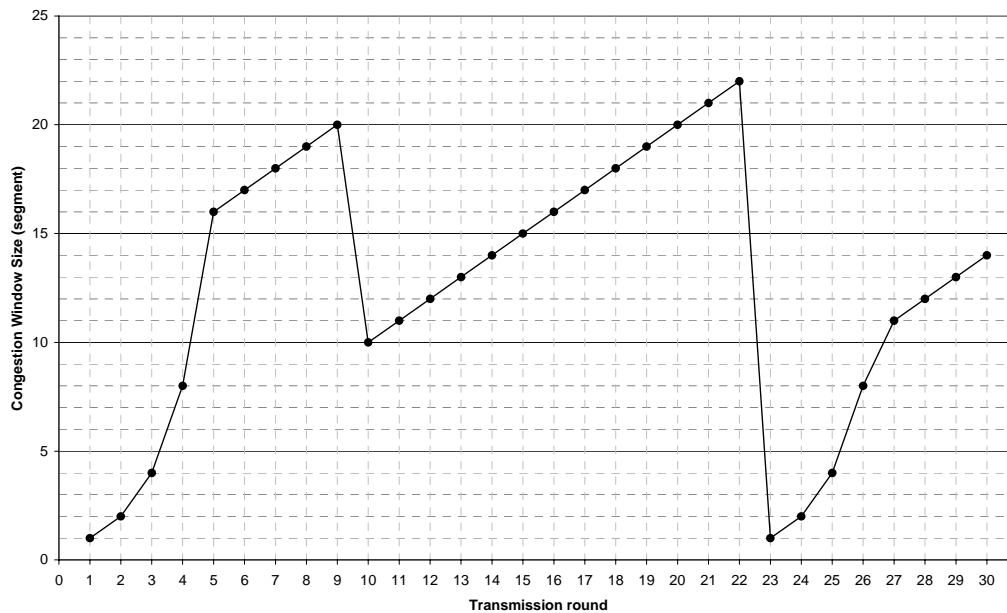
COE 344 – Computer Networks (T092)

Homework # 03 (due date & time: Tuesday 27/04/2010 during class period)

**Late homework submission will NOT be accepted**

\*\*\* Show all your work. No credit will be given if work is not shown! \*\*\*

**Problem # 1 (60 points):** Consider the following plot of TCP window size as a function of time.



Assuming TCP *Reno* is the protocol experiencing the behavior shown above, answer the following questions.

- (8 points) Identify the intervals of time when TCP *slow start* is operating.
- (8 points) Identify the intervals of time when TCP *congestion avoidance* is operating.
- (6 points) After the 9<sup>th</sup> transmission round, is segment loss detected by a triple duplicate ACK or by timeout?
- (6 points) After the 22<sup>nd</sup> transmission round, is segment loss detected by a triple duplicate ACK or by timeout?
- (6 points) What is the initial value of Threshold at the first transmission round?
- (6 points) What is the value of Threshold at the 18<sup>th</sup> transmission round?
- (6 points) What is the value of Threshold at the 25<sup>th</sup> transmission round?
- (6 points) During what transmission round is the 70<sup>th</sup> segment sent?
- (8 points) Assuming a packet loss is detected after the 30<sup>th</sup> round by the receipt of a triple duplicate ACK, what will be the values of the congestion-window size and of Threshold?

**Problem # 2 (40 points; 10 points each):** For each of the following TCP Reno scenarios, show the remainder of the traffic exchange (e.g. acknowledgements with sequence numbers, retransmissions with sequence numbers and size of data field, ...) assuming that no timeout takes place, time between any two received TCP segments is larger than 500 ms, all segments are received before a retransmission is received.

