

Diagnostic Examination: Fall 2003
CS555: Introduction to Networks & Communications

Question 1: Answer the following questions in the context of TCP protocol.

- (a) Show the congestion window size, the threshold, and the maximum amount of data that may be sent (all in Kbytes) in each of the 12 transmissions starting at time t_0 (just after an earlier timeout). Use the below data to answer the question.

| | |
|-----------------------------------|---------------------|
| Threshold at t_0 | 16 Kbytes |
| Maximum segment size | 2 Kbytes |
| Receiver's window size (constant) | 20 Kbytes |
| Successful transmissions | Segments 1-8, 10-12 |
| Timedout transmissions | Segment 9 |

- (b) Briefly explain why TCP connections always do not start from sequence number zero as in a sliding-window protocol at the datalink layer.

Question 2:

- (a) An application produces output in terms of 1-Mbyte bursts. Each burst has a 10 msec duration, and bursts occur at a constant interval of 250 msec (i.e., 4 in a second). The application lasts for 1.5 seconds. Suppose a leaky bucket with a capacity of 2 Mbytes and an output rate of 3 Mbyte/sec is being used to shape traffic from the application. Show the input and output to/from the leaky bucket as a function of time. Is there a loss? If so, during which input bursts?
- (b) Give one example (or scenario) each to illustrate the use of ARP and RARP protocols in networks.

Question 3:

- a. 50 workstations are connected with a 80 Mbps 2-km cable (propagation speed of 200 km/msec), using IEEE 802.3 protocol with 128-byte fixed packets. What impact (if any) would the chosen packet size have on the performance of the system? Illustrate the impact using an example scenario.
- b. How does the bandwidth (BW) and round-trip delay (RT) product (i.e., BW*RT) of a link influence the design of a sliding-window protocol on that link? (Hint: Consider the three cases with the product = 100 Mbytes, 100 Kbytes, and 100 bytes)