Introduction to Computer Networks Midterm-1, Fall 2009

Name:_____ ID:_____ Score:_____

1. (5%) (a) What are the advantages of packet switching over circuit switching?
   (b) What the advantages of circuit switching over packet switching?

2. (10%) Suppose there is exactly one packet switch between a sending host and a receiving host. The transmission rates between the sending host and the switch and between the switch and the receiving host are both R. The propagation delays between the sending host and the switch and between the switch and the receiving host are both D. The processing delays and queueing delays are zero.
   (a) Assuming that the switch uses stored-and-forward packet switching, what is the total end-to-end delay to send a packet of length L?
   (b) Suppose that the switch does not store-and-forward packets but instead immediately transmit each bit it receives before waiting for the entire packet to arrive. What is the total end-to-end delay to send a packet of length L?

L/R

應用層
傳輸層
~~實體層~~
網路層
連結層
實體層

3. (10%) (a) What layers in the Internet protocol stack does a router process?
   (b) What layers in the Internet protocol stack does a host process?

4. (5%) A packet switch receives a packet and determines the outbound link to which the packet should be forwarded. When the packet arrives, x bits of the currently-being-transmitted packet have been transmitted, and n packets are already in the queue. Suppose that all packets have length L and the transmission rate is R. What is the queueing delay for the packet?

5. (5%) The bandwidth-delay product for a communication link is defined as the product of the bandwidth and the propagation delay of the communication link. Provide an interpretation of the bandwidth-delay product.

6. (10%) Consider sending a large file of F bits from host A to host B. There are two links and one switch between A and B, and the links are uncongested (that is, no queueing delays). Host A segments the file into segments of S bits each and add 64 bits of header to each segment, forming packets of L=64+S bits. Each link has a transmission rate of R bps. The propagation delay from A to the switch is X, and the propagation delay from the switch to B is Y. Find the delay for sending the whole file.

$\frac{F}{S}$ $\frac{64+S}{R} + X + Y$ $\frac{(F+1)}{S}$

7. (5%) What are the four components of the cookie technology?

8. (10%) (a) Describe how Web caching can reduce the delay in receiving a requested object.
   (b) Will Web caching reduce the delay for all objects requested by a user or for only some of the objects? Why?

9. (5%) What are the three major components of the Internet mail system?

10. (15%) Suppose within your Web browser you click on a link to obtain a Web page. The IP address of the Web server is cached in your local host. The Web page references N very small objects on the same server. Let the round trip time between the local host and the Web server be RTT. Neglecting the transmission time, how much time elapses with
    (a) Non-persistent HTTP with no parallel TCP connections?
    (b) Non-persistent HTTP with parallel TCP connections?
    (c) Persistent HTTP with pipelining, i.e., multiple HTTP requests can be sent one after another without waiting for replies to previous requests?

11. (5%) Describe why an application developer might choose to run an application over UDP rather than TCP.

12. (5%) Suppose a process in Host C has an UDP socket with port number 6789. Suppose both Host A and Host B each sends an UDP segment to Host C with destination port number 6789. Will both of these segments be directed to the same socket at Host C? If so, how will the process at Host C know that these two segments originated from two different hosts?

13. (5%) Explain the problems with a centralized design of a DNS system?

14. (5%) Describe the functions of a local name server.