Network Comprehensive Examination
March 19, 2013

Work any 5 of the following problems. DRAW A CIRCLE around the number of the one you do NOT want graded. You may use a calculator (nothing connected to the Internet or telephone nets). You must work on your own and you may not refer to any other material (books, notes, etc.) If the problem requires math, **show how you obtain your answer** or your answer will not receive credit.

1. A file of 100,000 bytes is to be transmitted using TCP/IP across a 10 megabit per second link. The MTU on the link is 1,000 bytes, and the link layer frame header is 15 bytes. The one-way propagation delay is 20 microseconds. Answer each of the following:

    a. How many frames will be transmitted?

    b. If all packets can be transmitted without response from the receiver (that is, ignoring any ACK effects), what is the total time required to transfer the file?

2. A disadvantage of a broadcast subnet is the capacity wasted when multiple hosts attempt to access the channel at the same time. For example, suppose that time is divided into discrete slots with each of the n hosts attempting to use the channel with probability p during each slot. (The transmission attempts are mutually independent.) What fraction of the slots is wasted due to collisions?

3. Consider the following exchange:

   tclient.net.39904 > telnet.com.23: S 733381829:733381829(0) win 8760 <mss 1460> (DF)

   telnet.com.23 > tclient.net.39904: S 1192930639:1192930639(0) ack _____ win 1024 <mss 1460> (DF)

   a. Which layer 4 protocol generated these datagrams? _____

   b. What does the S mean in the first datagram and why is it used?

   c. What number should appear in the blank (second datagram)?

   d. What will happen (and why) if the next datagram sent by tclient.net contains 1400 bytes?

4. If you observe traffic on an Ethernet, you will see many packets containing the words (data) “Who owns n1.n2.n3.n4?” Here n1, n2, n3, n4 represent parts of an arbitrary IP address.

    a. What protocol sends these messages?

    b. What information is needed by the sender?

5. The bit stream 11010111 is transmitted using the standard CRC method with generator polynomial corresponding to 1001. Show the actual bit stream that will be transmitted.

6. Name each of the following architectures/technologies:

    a. The LAN that uses exponential back-off _____.

    b. IEEE 802.5 is known as _____.

    c. The connection oriented architecture known for transmitting “cells” is _____.

    d. The architecture that dominated networking among the Fortune 500 in the 1980s _____.

    e. Today’s architecture that was originally funded by the US government (mostly) to achieve greater routing flexibility and survivability is _____.