

*CSCI 373: Computing Networks
Final Exam -- open book section*

The entire exam is to be turned in at 11:55 AM. Work the closed book section first and turn it in before you consult your books and notes to work on the open book section.

Problem 1. (10 points)

Music is encoded on CDs at a bit rate of about 1,400,000 bits per second. Suppose you wish to connect several CD players to a network and distribute music to several "listening stations." In about one paragraph each, describe the potential *problems* of using each of the following five LAN protocols, Ethernet, token ring, token bus, FDDI, and DQDB, to transmit the music.

Problem 2. (4 points)

Under what circumstances is a 4Mbps token ring faster than a 10Mbps Ethernet?

Problem 3. (2 points)

What symbols are used to transmit the characters 'Hi' on an FDDI network? By the way, the ASCII bit string for 'Hi' is 0100100001101001?

Problem 4. (4 points)

If a transparent bridge connects two Ethernet segments, one with 6 hosts and the other with 4 hosts, what is the minimum number of packets that must be transmitted before the bridge learns the location of all the hosts? Be sure to justify your answer!

Problem 5. (6 points)

If the telephone company offered to you and to all your friends and family either X.25 service or ISDN service for free, which one would you choose? Once again, explain the reasons for your choice.

Problem 6. (6 points)

Suppose you have a mesh of LANs interconnected by spanning tree bridges. After an epidemic of bridge and LAN crashes, the bridge with the highest priority (the lowest id number) is connected to only one LAN. Will this node still be elected root even though it can't forward traffic between two LANs? How will this effect the efficiency of the network?

Problem 7. (4 points)

What happens when the following C code is executed?

```
main () {
    if (fork()==0)
        printf("Print me\n") ;
    fork() ;
    printf("Print me also\n") ;
}
```

Problem 8. (4 points)

In a stream-based socket program, what are the calls that must be simultaneously executed by the client and server to make the connection?

Problem 9. (4 points)

Why do most Unix-based server applications make the `fork` system call after a new connection is established?

Problem 10. (8 points)

Suppose you have a TCP application in which data is transmitted in large 5000 byte long "records" from a computer connected to an Ethernet. 5000 bytes is too big to go over the Ethernet, so the records must be broken down into four smaller packets. There are two ways your operating system could send this 5000 byte message. (1), the 5000 bytes can be broken into four TCP segments. Each TCP segment could then be transmitted as an unfragmented IP packet with its own IP header. (2), the 5000 bytes can be placed into one TCP segment which is fragmented into four IP packets.

Problem 10A.

Illustrate the two possibilities with a couple of drawings that show where the IP and TCP headers are located within the four Ethernet packets.

Problem 10B.

Discuss the advantages and disadvantages of each approach. Be sure to mention differences in speed and reliability.

Problem 11. (8 points)

Describe a useful protocol for a networked quote server. You'd expect the quote server to store a massive collection of witty sayings which may be indexed either by author or by topic. Use ASN.1 to describe that data records the client and server will exchange.

Problem 12. (0 points)

In the recently released movie *Wayne's World 2*, Garth's new girlfriend is shown carrying a copy of *Unix Network Programming* by Richard Stevens. Does this mean that socket programming is cool?