Data Communications CS420/520

Axel Krings

Midterm 2 -- Lecture 37 – Fall 1999

Name: _____ Student ID: _____

This is a *closed* book, *closed* note exam. You may use a calculator but **no computers**. Show **ALL** your work to get full or partial credit for the problem. You have 50 minutes.

Problem	Total	Points
1	20	
2	13	
3	10	
4	20	
5	15	
6	22	
Total:	100	

1. (20 pts) With respect to multiplexing

   a) (2 pts) Using frequency division multiplexing, what is the required bandwidth if 24 channels are to be multiplexed, where each channel has a bandwidth of 4kHz?

   b) (4 pts) What is the main difference between synchronous time-division multiplexing and statistical time-division multiplexing?

   c) (8 pts) Using statistical time-division multiplexing we assume that there is a collection of 56Kbps multiplex together on a 10Mbps line (approximate K=1,000 and M=1,000,000). Assuming that all of the terminals transmit an average of 50% of the time and the multiplexer compresses data at its inputs to 70% (not by 70%). What is the maximum number of computers we can reasonably expect to support?

   d) (6 pts) A DS-1 (T1) line has a data rate of 1.544Mbps. Explain how this rate is composed, i.e., how does one come up with such a rate? (HINT: start with "a phone channel has a bandwidth of 4kHz …")

2. (13 pts) Answer the following questions briefly:

a) (3 pts) Briefly describe the following terms

i) 10 Base 2

ii) 10 Base T

iii) 10 Base F

b) (4 pts) With respect to ISDN

i) What data rates are associated with the 3 channels?

ii) What is the D-channel used for?

c) (6 pts) Assume we have a Token ring network that is 500m in length and operating at 100Mbps (100 x 2^{20} bits per second). The network has 50 stations each of which introduces a 1 bit buffer, and a monitor station which introduces a 27 bit buffer. The ring consists of _____ bits.

3. (10 pts) This question considers CSMA/CD.

   a) (2 pts) What does CSMA/CD stand for?

   b) (2 pts) Is this used in broadcast or ring networks?

   c) (6 pts) Is it important to define a minimum length of a packet if one wants to be able to detect collisions? If yes, how does one define the minimum length? Be precise!

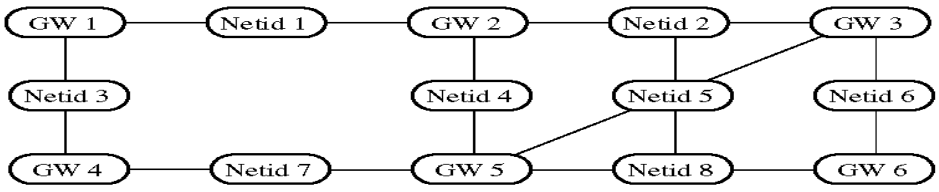
4. (20 pts) Answer the questions about Hubs, Switches, Bridges and Gateways in the space provided:

a) What is the main difference between a hub and a switch?

b) Fast Ethernet allows us to use 2 segments of 100m each. This means that you can build a hub-tree with two levels. Assuming we use 24-port hubs or switches with 100Base-T ports, how many nodes can we possibly connect to this subnet?

c) What is the difference between a *transparent* bridge and a *source routing* bridge?

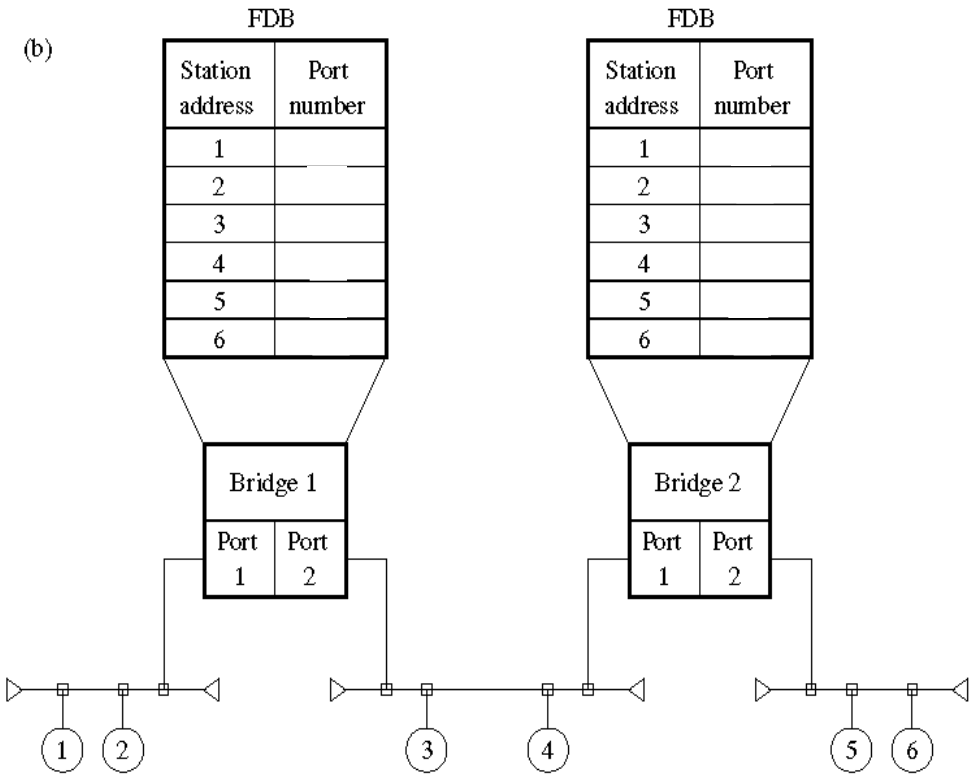
d) The graph below indicates gateways (GW) and networks. Indicate a spanning tree, assuming that data rates and cost are the same for each network.



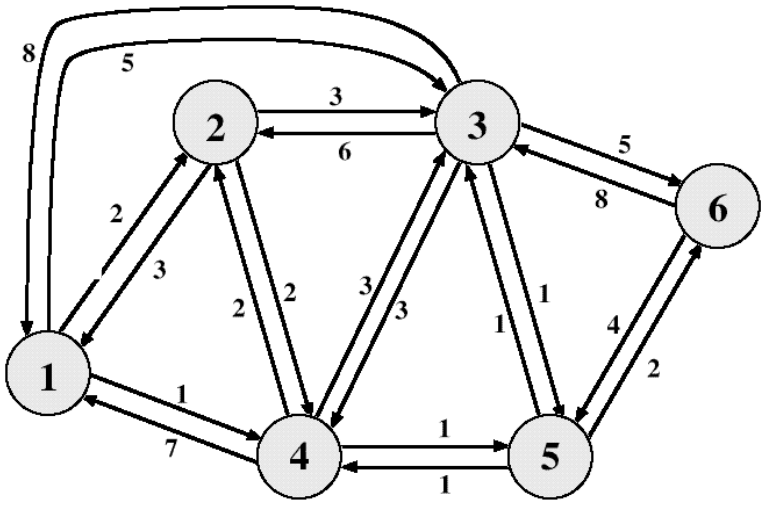
5. (15 pts) Answer the following questions:

a) (8) Assume we have the following two routing bridges, three subnets with two nodes each. Fill in the routing tables.

(b)



b) (7) Given the following network, indicate the *shortest path* and the *least-cost path* from node 1 to 6. The numbers next to the links indicate the cost.



6. (22 pts) With respect to Internetworking

a) (5) What are the basic differences between Class-A, Class-B and Class-C networks?

b) (4) What is a *netmask*?

c) (4) How does one address all computers in a network?

d) (5) What is the difference between *Internet*-Fragmentation and *Intranet*-Fragmentation?

e) (4) Which of the two fragmentations (internet or intranet) does IP use?