CPS 472/572: Exam 1 **Name:**____

Instructor: Dr. Clark February 7, 1996

This test is closed book and closed notes. You may use a calculator. Answer the questions in the space provided. When answering questions, please state any and all assumptions you are making. For questions involving calculation, indicate your final answer by circling it.

Part 1 (20 points)

The most common approach to designing communication protocols is to organize the communication functions into several different layers. For example, the Open Systems Interconnection model identifies seven distinct layers of functionality. In many cases, protocols are implemented to adhere to this layering model.

1. What are some advantages to using a layering approach in the design and implementation of communication protocols? (Name at least 2.)

2. A protocol is a form of agreement. In particular, we discussed three things that must be agreed upon when designing a protocol. What are these three things?

Part 2 (20 points)

In this class we have discussed three different devices that can be used for interconnecting LAN segments.

1. What are these three devices? Describe what each device does. Indicate the layer of the OSI model that best fits the function of each device.

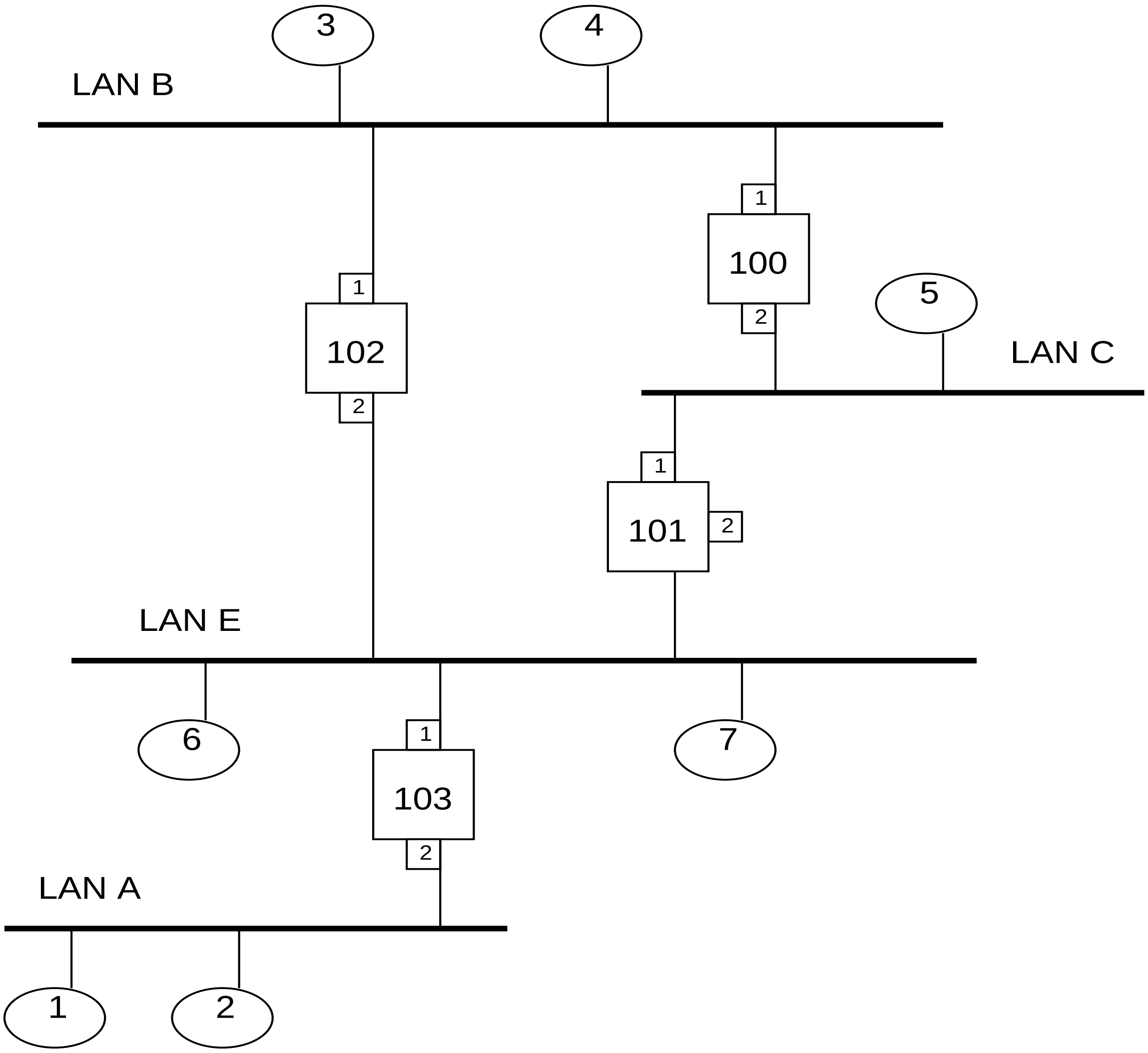
2. For the following scenarios, indicate which device should be used to provide the connection. In each case, assume that only one device will be used.

   (a) Four different LAN segments in different buildings. Two of the LANs are Ethernet and two are Token-Ring.

   (b) Two Ethernet LANs in the same room. After the LANs are connected, a significant portion of the traffic will be between hosts on different segments.

Part 3 (20 points)

The following diagram depicts a network with five LAN segments, seven end-hosts and four *source routing bridges*.



1. Show the spanning tree that would be established for this network. Assume that all links and bridges are operational.
2. Suppose that host 4 needs to send a single data frame to host 2. Determine the total number of frames generated in this network in order to send this data. Show the number of frames at each phase of the source routing protocol.
3. Now, suppose that host 4 needs to send a second data frame to host 2. What is the total number of network frames generated in sending this data?

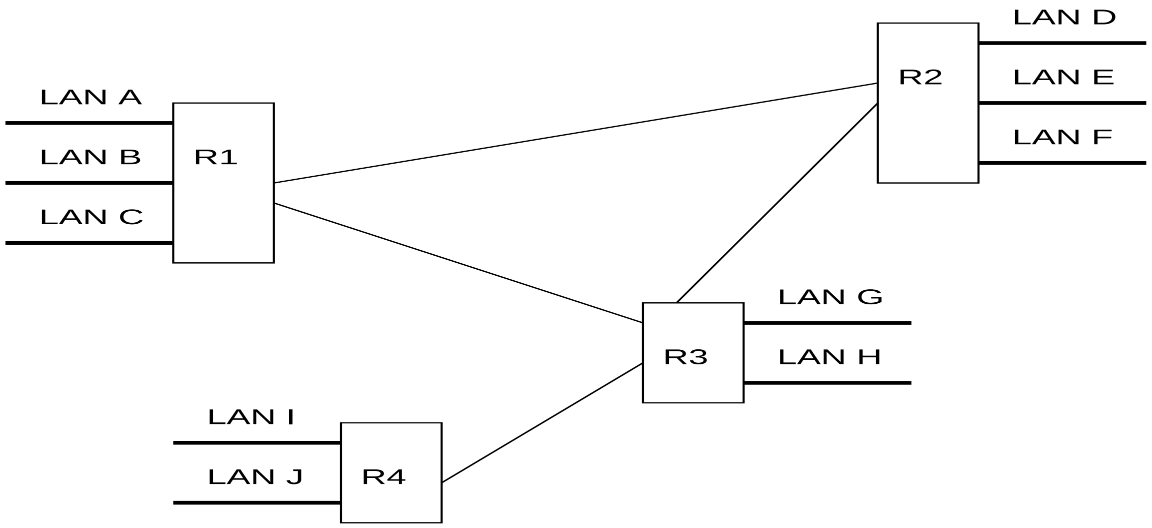
Part 4 (20 points)

1. Why is it necessary to calculate a spanning tree when LANs are connected using Transparent Bridges?

2. What are the advantages and disadvantages to using Transparent Bridges to connect LAN segments?

Part 5 (20 points)

The following diagram depicts a network with 10 LAN segments and four routers. The routers are connected via point-to-point links. Numerous end hosts are connected to the LAN segments but are not shown in the diagram. The routers are using a *distance vector routing protocol.*



1. Show the *initial routing table* for each router. (Initial means before any packets are exchanged.) Assume that all links and routers are operational.

2. Show the *final routing table* for each router after all of the distance vectors have been shared and the tables have stabilized.