ECE 462 **Data and Computer Communications**
Solutions to Homework 10

Question 15.4
Bus: all stations attach, through appropriate hardware interfacing known as a tap, directly to a linear transmission medium, or bus. Full-duplex operation between the station and the tap allows data to be transmitted onto the bus and received from the bus. A transmission from any station propagates the length of the medium in both directions and can be received by all other stations. At each end of the bus is a terminator, which absorbs any signal, removing it from the bus.
Tree: a generalization of the bus topology. The transmission medium is a branching cable with no closed loops. The tree layout begins at a point known as the head end. One or more cables start at the head end, and each of these may have branches. The branches in turn may have additional branches to allow quite complex layouts. Again, a transmission from any station propagates throughout the medium and can be received by all other stations.
Ring: the network consists of a set of *repeaters* joined by point-to-point links in a closed loop. Each station attaches to the network at a repeater and can transmit data onto the network through the repeater.
Star: each station is directly connected to a common central node. Typically, each station attaches to a central node via two point-to-point links, one for transmission and one for reception.

Question 15.5 To develop LAN standards.

Question 15.6 No single technical approach will satisfy all requirements. Requirements with respect to cost, data rate, and range dictate a variety of technical alternatives.

Question 15.7
Unacknowledged connectionless service: This service is a datagram-style service. It is a very simple service that does not involve any of the flow- and error-control mechanisms. Thus, the delivery of data is not guaranteed.
Connection-mode service: This service is similar to that offered by HDLC. A logical connection is set up between two users exchanging data, and flow control and error control are provided.
Acknowledged connectionless service: This is a cross between the previous two services. It provides that datagrams are to be acknowledged, but no prior logical connection is set up.

Question 15.8
Type 1 operation supports unacknowledged connectionless service. There is no acknowledgment, flow control, or error control.

Type 2 operation supports connection-mode service, using mechanisms similar to HDLC.
Type 3 operation supports acknowledged connectionless service. Each transmitted PDU is acknowledged using a stop-and-wait technique.

Question 15.9
(1) On transmission, assemble data into a frame with address and error-detection fields.
(2) On reception, disassemble frame, and perform address recognition and error detection.
(3) Govern access to the LAN transmission medium.

Question 15.10
For a bridge that connects LANs A and B:
(1) Read all frames transmitted on A and accept those addressed to any station on B.
(2) Using the medium access control protocol for B, retransmit each frame on B.
(3) Do the same for B-to-A traffic.

Problem 15.1 HDLC has only one address field. In a LAN, any station may transmit to any other station. The receiving station needs to see its own address in order to know that the data is intended for itself. It also needs to see the sending address in order to reply.

Problem 15.2 Each individual character could be sent out as a separate packet, resulting in tremendous overhead. This problem could be overcome by buffering characters and only sending out blocks of characters.

Problem 15.4
a. Assume a mean distance between stations of 0.375 km. This is an approximation based on the following observation. For a station on one end, the average distance to any other station is 0.5 km. For a station in the center, the average distance is 0.25 km. With this assumption, the time to send equals transmission time plus propagation time.

$$T = \frac{10^3}{10^7} + \frac{375}{200 \times 10^6} = 102 \mu \sec$$

b.

$$T_{\text{interfere}} = \frac{375}{200 \times 10^6} = 1.875 \mu \sec$$

$$T_{\text{interfere}(bit-times)} = 1.875 \mu \sec \times 10^7 = 18.75 bit-times$$

Problem 15.5
a. Again, assume a mean distance between stations of 0.375 km.

$$T = \frac{10^3}{10^8} + \frac{375}{200 \times 10^6} = 12\mu\sec$$

b.

$$T_{\text{int}\,erfere} = \frac{375}{200 \times 10^6} = 1.875\mu\sec$$

$$T_{\text{int}\,erfere(bit\,-\,times)} = 1.875\mu\sec \times 10^7 = 18.75 bit - times$$

15.6 a.

$\frac{1bit}{1Mbps} = 1\mu\sec$, equivalent of *200* meters

b.

$\frac{1bit}{40Mbps} = 1\mu\sec$, equivalent of *5* meters