Indian Institute of Technology Bombay

Department of Electrical Engineering

Handout 26 EE 706 Communication Networks

Solutions to Quiz 9 March 26, 2010

1. Classify the following MAC addresses which have been written in hexadecimal notation as unicast, broadcast and multicast addresses.

   [5 points]

   - AA BB CC AA BB CC - **Ans.** Multicast
   - 11 11 11 11 11 11 - **Ans.** Unicast
   - FF FF FF FF FF FF - **Ans.** Broadcast
   - 44 44 44 44 44 44 - **Ans.** Unicast
   - EE EE EE EE EE EE - **Ans.** Multicast

   Only the MAC address with all 1s is a broadcast address. A MAC address is a multicast address if the first bit is 1 and atleast one of the other bits is 0. A MAC address is a unicast address if it is not a multicast or broadcast address.

2. A hypothetical CSMA/CD system has three copper twisted-pair segments connected together by two repeaters. Each segment is 200 metres long. The one-way processing delay at a repeater is one microsecond. We wish to operate this system at 10 megabits per second. If the speed of the signal in copper is 2×10^8 metres per second, what is the minimum size of the frame in such a system which will ensure that a collision never goes undetected? [5 points]

   Ans. In a CSMA/CD system, a node listens to the channel only when it is transmitting. To always detect a collision it must listen for at least a round-trip time after it starts transmitting. So the minimum size of the frame should be such that the node transmits for the maximum round-trip time.

   The signal takes 1 microsecond to travel through each segment and since each repeater introduces a delay of 1 microsecond, the maximum propagation delay is 5 microseconds. So the maximum round-trip time is 10 microseconds. Since the data rate is 10 Mbps, in order for the frame transmission to last one round-trip time the size of the frame should be at least 10 Mbps $\times$ 10 microseconds which is equal to 100 bits.