Com S 486 Assignment 5

Due: Friday, April 26, 11:59pm

1. [20pts] Consider two nodes A and B, with propagation delay 200 bit times (i.e., the delay equal to the time to transmit 200 bits) between them, share the same broadcast channel using CDMA/CD. Suppose A and B each begins transmitting an Ethernet frame of 512 bytes at t=0 bit time. When will they detect (in the unit of bit time) collisions? After detection, they back off with parameters K_A = 0 and K_B = 1 respectively. At what time does B begin its retransmission actually? At what time does A begin its retransmission actually? (Note: the nodes must wait for an idle channel after returning to Step 2.)

2. [15pts] Suppose nodes A and B are on the same broadcast channel, and the propagation delay between the two nodes is 200 bit times. Suppose CSMA/CD and Ethernet packets are used for this broadcast channel. Suppose node A begins transmitting a frame and, before it finishes, node B begins transmitting a frame. Can A finish transmission before it detects that B has transmitted? Why or why not? If your answer is yes, then A incorrectly believes that its frame was successfully transmitted without a collision. (Hint: Suppose at time t=0 bits, A begins transmitting a frame. In the worst case, A transmits a minimum-size Ethernet frame of 512+64 bit times. So A would finish transmitting the frame at t=512+64 bit times. Thus, the answer is no, if B's signal reaches A before t=512+64bits. In the worst case, when does B's signal reach A?)

3. [15pts] Let's consider the operation of a learning switch in the context of a network in which 5 nodes labeled A through E are star connected into an Ethernet switch. Suppose that (i) A sends a frame to C, (ii) C replies with a frame to A, (iii) B sends a frame to A, (iv) A replies with a frame to B. The switch table is initially empty. Show the state of the switch table before and after each of these events.

4. [20pts] Suppose you walk into a room, connect to Ethernet (which is already connected to Internet), and want to download a Web page. What are all the protocol steps that take place **in order** starting from powering on PC to getting the Web page? Assume there is nothing in the DNS or browser caches when you power on your PC. (Hint: the steps include the use of ARP, DHCP, DNS, Ethernet, HTTP, and TCP protocols.)

5. [10pts] Consider an application of CDMA. For a sender with CDMA code (1, -1, 1, -1, 1, -1, 1, -1), what are signal 1 and -1 encoded to, respectively?

6. [20pts] Suppose an 802.11b station is configured to always reserve the channel with the RTS/CTS sequence. Suppose this station suddenly wants to transmit 512 bytes of data, and all other stations are idle at the time. As a function of SIFS and DIFS, and ignoring propagation delay and assuming no bit errors, calculate the time required to transmit the frame and receive the acknowledgement.