**Worksheet 16**

1. List three different types of MAC protocols. Give example(s) for each type.

* + channel partitioning
    - Example: TDMA, CDMA
  + random access
    - Example: Internet, ALOHA
  + “taking turns”
    - Example: Coding, Token passing

Xfinity Modem/Router uses all three protocols.

2. In Section 6.3 (Slide 6-19), we listed four desirable characteristics of a broadcast channel.

(a) Which of these characteristics does TDMA have?

2. when M nodes want to transmit, each can send at average rate R/M

4. Simple

(b) Which of these characteristics does slotted ALOHA have?

1. When one node wants to transmit, it can send at rate R.
2. when M nodes want to transmit, each can send at average rate R/M
3. NO
4. Simple

(c)Which of these characteristics does token passing have?

1. When one node wants to transmit, it can send at rate R.
2. when M nodes want to transmit, each can send at average rate R/M
3. Full decentralized
   1. No special node to coordinate transmission
   2. No synchronization of clocks, slots
4. Simple

3. In CSMA/CD, after the fifth collision, what is the probability that a node chooses *K* = 4? The result *K* = 4 corresponds to a delay of how many seconds on a 10 Mbps Ethernet?



K chooses among {0,1,2,3,……31}

P = 1/32

If K=4, ⇒ 4x512 / 10Mbps = 4x512 / 10\*10^6 bps = 204.8ms

4. Carrier sense and collision detection. Suppose nodes A and B are on the same 10 Mbps Ethernet segment, and the propagation delay between the two nodes is 225 bit times. Suppose at time *t=0*, B starts to transmit a frame. Suppose A also transmits at some *t=x*, but before completing its transmission it receives bits from B (hence, a collision occurs at A). Assuming node A follows the CSMA/CD protocol, what is the maximum value of *x*?

Max x is 224.

5. Consider a broadcast channel with N nodes and a transmission rate of R bps. Suppose the broadcast channel uses polling (with an additional polling node) for its multiple access. Suppose the amount of time from when a node completes transmission until the subsequent node is permitted to transmit (that is, the polling delay) is tpoll. Suppose that within a polling round, a given node is allowed to transmit at most Q bits. Further suppose node 1, initially with no bits to send, receives Q bits to send. What is the maximum time from when node 1 receives the bits until it can begin to send them?

tpoll = Qbits =

[(N-1)\*Q/R ] + [(N\*tpoll)]

6. Describe polling and token-passing protocols using the analogy of cocktail party interactions.

In polling, a discussion leader allows only one participant to talk at a time, with each participant getting a chance to talk in a round-robin fashion. For token ring, there isn't a discussion leader, but there is wine glass that the participants take turns holding. A participant is only allowed to talk if the participant is holding the wine glass.