Link Layer - Homework Questions

Q1. What are some of the possible services that a link-layer protocol can offer to the network layer? Which of these link-layer services have corresponding services in IP and TCP?

Q2. Why is an ARP query sent within a broadcast frame? Why is an ARP response sent within a frame with a specific destination MAC address?

Q3. Suppose nodes A, B and C each attach to the same broadcast LAN through their adapters. If A sends thousands of IP datagrams to B with each encapsulating frame addressed to the MAC address of B, will C's adapter *process* these frames? If so, will C's adapter pass the IP datagrams in these frames to C (that is, the adapter's parent node)? How would your answers change if A sent frames with the MAC broadcast address?

Q4. Consider a network with 6 nodes connected in a star topology (all nodes directly connect to a switch) to a central switch. Suppose that (i) A sends a frame to D, (ii) D replies with a frame to A, (iii) C sends a frame to D, (iv) D replies with a frame to C. The switch table is initially empty. Show the state of the switch table before and after each of these events. For each of these events, identify the link(s) on which the transmitted frame will be forwarded, and briefly justify your answers.

Q5. Why are Acknowledgment used in 802.11 but not used in wired Ethernet?

Q6. Why would the token passing protocol be inefficient if a LAN had a very large perimeter?

Q7. In CSMA/CD, after the fifth collision, what is the probability that a node chooses *K=4*?

Q8. Consider the three LANs interconnected by two routers, as show in the figure below.

(a) Assign IP addresses to all of the interfaces. For Subnet 1 use addresses of the form 192.168.1.xxx; for Subnet 2 use addresses of the form 192.168.2.xxx; and for subnet 3 use addresses of the form 192.168.3.xxx.

(b) Assign MAC addresses to all of the adapters.

(c) Consider sending an IP datagram from Host E to Host B. Suppose all of the ARP tables are up to date. Enumerate all the steps, as done for the single-router example in Section 5.4.1 of the textbook.

(d) Repeat (c), now assuming that the ARP table in the sending host is empty (and the other tables are up to date)