ELEC3500 TELECOMMUNICATIONS NETWORKS
Problem Set – 10

10.1 What do you understand by "framing" in the link layer?

10.2 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 link?

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

10.4 Suppose the information content of a packet is the bit pattern 1010011101011001 and an even parity scheme is being used. For a two-dimensional parity scheme, what is the value of the field containing the parity bits?

10.5 Consider three LANs interconnected by two routers, as shown in Figure 10.1.

    a.   Assign IP addresses to all of the interfaces. For Subnet 1, use addresses of the form 192.168.1.xxx; for Subnet 2, uses 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. Show all the steps needed to send the datagram.
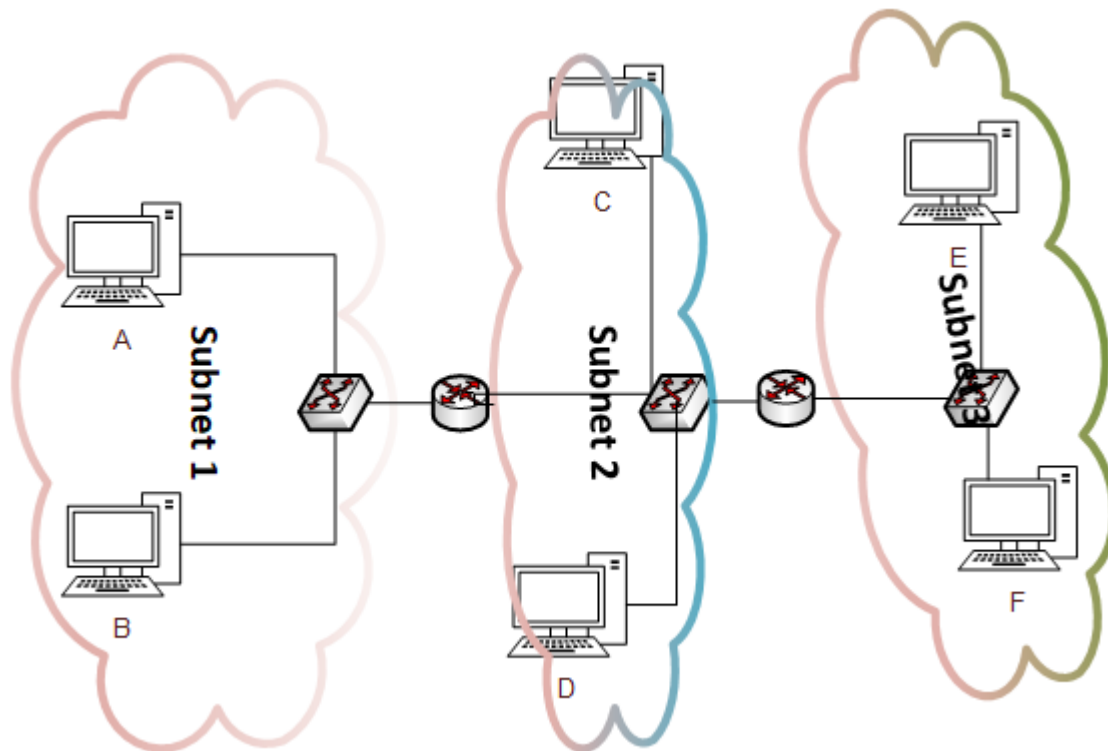

Figure 10.1

10.6 Consider Figure 10.2 but where all the links are 120 Mbps. What is the maximum total aggregate throughput that can be achieved among the 12 hosts (four in each department) and the two servers in this network? You can assume that any host or server can send to any other host or server.
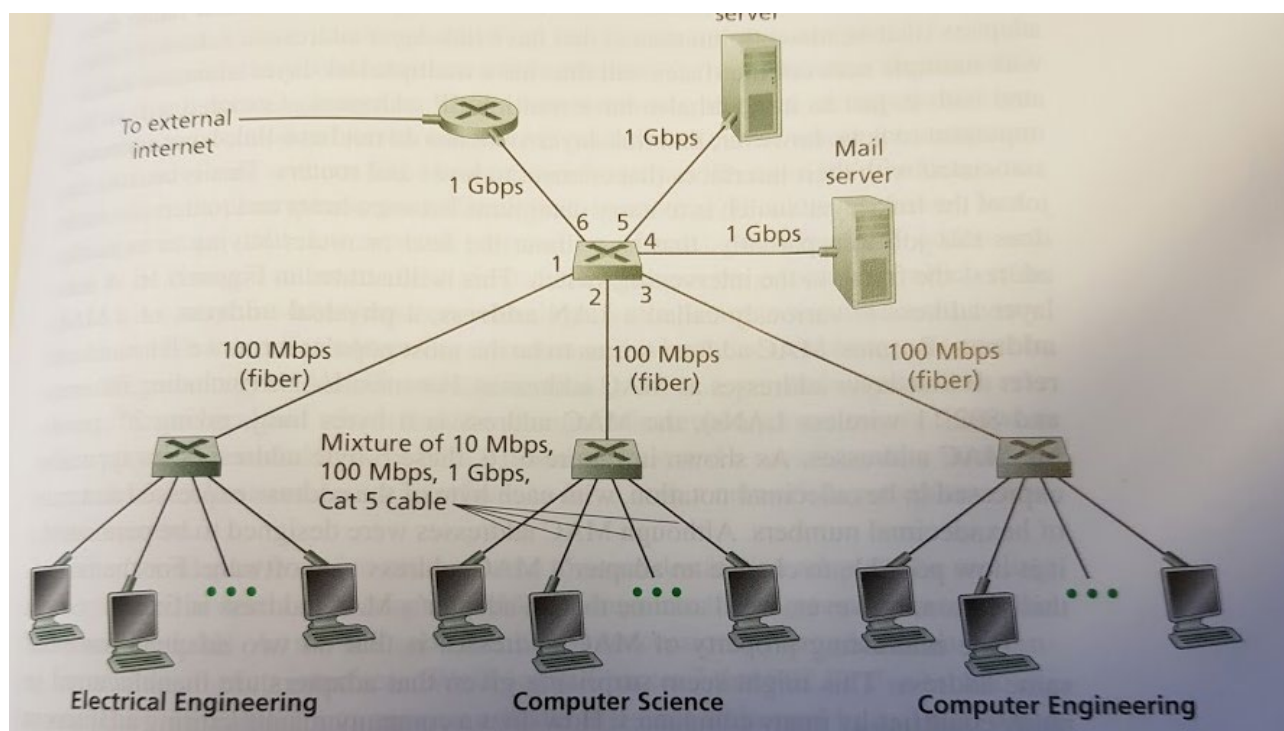
Figure 10.2

10.7 Consider a single-switch VLAN in Figure 10.3, and assume an external router is connected to the switch port 1. You are asked to assign IP addresses to the EE and CS hosts and router interface. Trace the steps taken at both the network layer and the link layer to transfer an IP datagram from an EE host to a CS host.
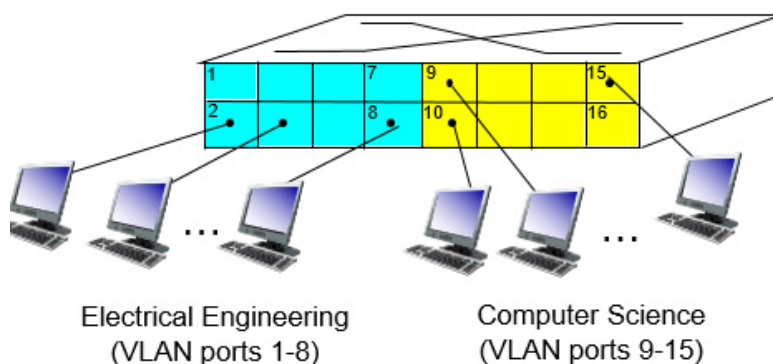

Figure 10.3

10.8 Suppose that four active nodes A, B, C and D are competing for access to a channel using the slotted ALOHA scheme. Assume each node has an infinite number of packets to send. Each node attempts to transmit in each slot with probability p. The first slot is numbered slot 1, the second slot is numbered 2, and so on.

    a. What is the probability that node A succeeds **for the first time** in slot 5?

    b. What is the probability that some node (either A, B, C or D) succeeds in slot 4?

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