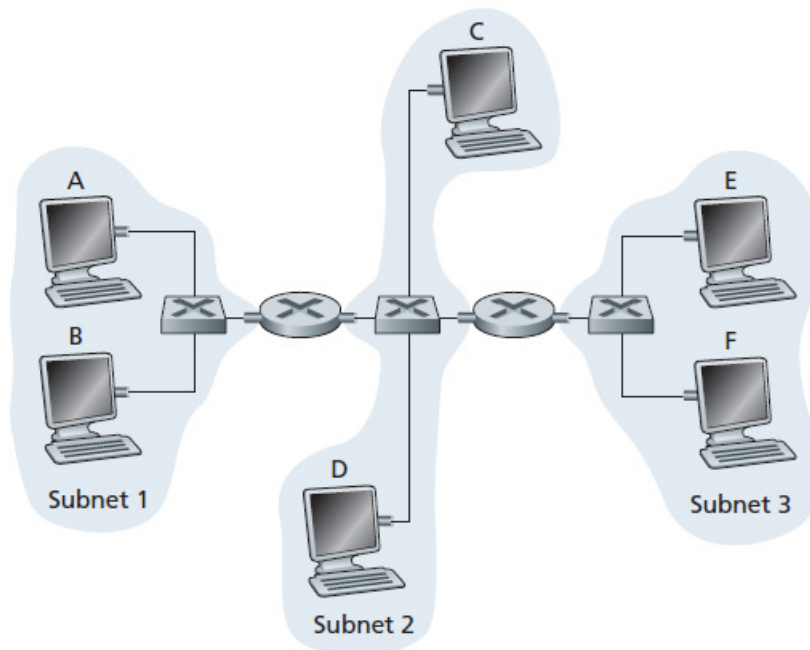


### CS5222 Assignment 3 (on Chapter 6)

P1. Suppose we are using cyclic redundancy check (CRC) for encoding. Consider the 5-bit generator,  $G=10011$ , and suppose that  $D$  has the value  $1010101010$ . What is the value of the remainder  $R$ ? What is the length of this remainder  $R$  (in bits)?

P15. Consider Figure 5.33. Now we replace the router between subnets 1 and 2 with a switch  $S1$ , and label the router between subnets 2 and 3 as  $R1$ .



**Figure 5.33** ♦ Three subnets, interconnected by routers

- Consider sending an IP datagram from Host E to Host F. Will Host E ask router R1 to help forward the datagram? Why? In the Ethernet frame containing the IP datagram, what are the source and destination IP and MAC addresses?
- Suppose E would like to send an IP datagram to B, and assume that E's ARP cache does not contain B's MAC address. Will E perform an ARP query to find B's MAC address? Why? In the Ethernet frame (containing the IP datagram destined to B) that is delivered to router R1, what are the source and destination IP and MAC addresses?
- Suppose Host A would like to send an IP datagram to Host B, and neither A's ARP cache contains B's MAC address nor does B's ARP cache contain A's MAC address. Further suppose that the switch  $S1$ 's forwarding table contains entries for Host B

and router R1 only. Thus, A will broadcast an ARP request message. What actions will switch S1 perform once it receives the ARP request message? Will router R1 also receive this ARP request message? If so, will R1 forward the message to Subnet 3? Once Host B receives this ARP request message, it will send back to Host A an ARP response message. But will it send an ARP query message to ask for A's MAC address? Why? Also, will switch S1 receive an ARP response message from Host B? Why?

P18. Suppose nodes A and B are on the same 10 Mbps broadcast channel, and the propagation delay between the two nodes is 325 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 transmitting before it detects that B has transmitted? Why or why not? If the 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-sized 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 bit time  $t=512+64$  bits. In the worst case, when does B's signal reach A?

P31. In this problem, you will put together much of what you have learned about Internet protocols. Suppose you walk into a room, connect to Ethernet, and want to download a Web page. What are all the protocol steps that take place, starting from powering on your PC to getting the Web page? Assume there is nothing in our DNS or browser caches when you power on your PC. (*Hint:* the steps include the use of Ethernet, DHCP, ARP, DNS, TCP, and HTTP protocols.) Explicitly indicate in your steps how you obtain the IP and MAC addresses of a gateway router.