Computer Networking

Assignment 4

Problem 1: CRC Error Detection (10 points)

Consider the 5-bit generator, G = 10011, and suppose that D has the value 1010101010 and 1000100101. What are the values of R?

Problem 2: Slotted Aloha (10 points)

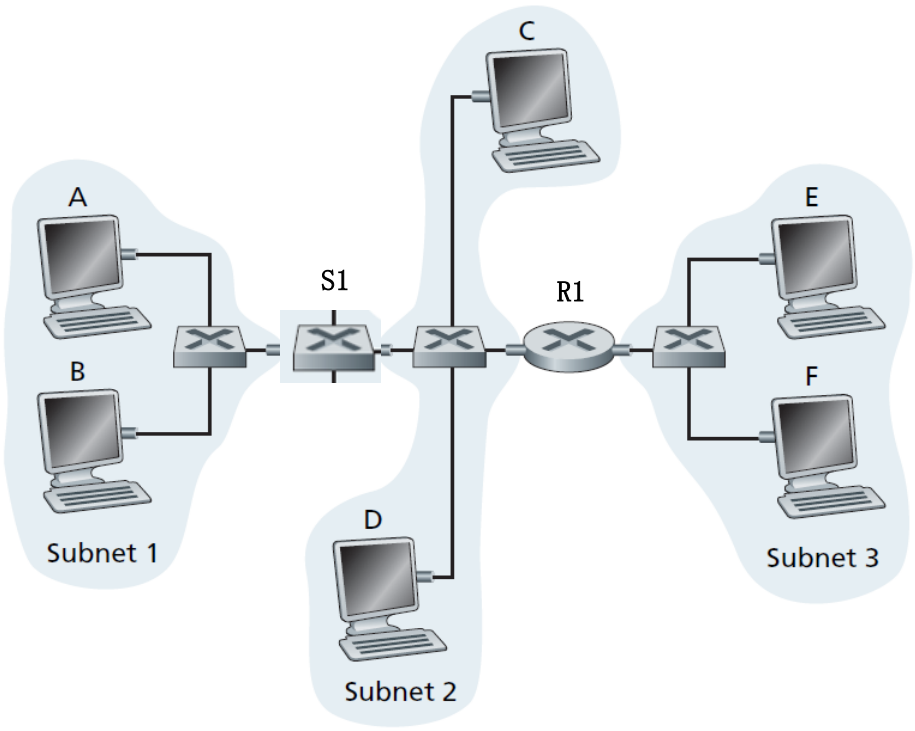
In this problem, we explore some of the properties of the CRC. For he generator G (= 1001) given in Section 6.2.3, answer the following uestions.

(1) Why can it detect any single bit error in data D?

(2) Can the above G detect any odd number of bit errors? Why?

Problem 3: ARP protocol (15 points)

Consider the following network. Notice that a Host A can learn that a Host B is on the same LAN by checking its own routing table (yes, a host has a routing table as a router) and finding that the subnet prefix of B's IP is the same as itself.



(1) 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?

(2) 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?

(3) 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? What will switch S1 do once it receives an ARP response message from Host B?

Problem 4: Switch self-learning (15 points)

Let's consider the operation of a learning switch in the context of a network n which 6 nodes labeled A through F are star connected into an Ethernet witch. Suppose that *(i)* B sends a frame to E, *(ii)* E replies with a frame to B, *iii)* A sends a frame to B, *(iv)* B replies with a frame to A. The switch table is initially empty. Show the state of the switch table before and after each f these events. For each of these events, identify the link(s) on which the ransmitted frame will be forwarded, and briefly justify your answers.