CMPEN/EE 362 - HW6

Student Name: _____

Problem 1

Suppose the content of a packet is 1101 0110 1001 1011. Give the error detection bits for each of the following codes:

a) 1-D even parity check
b) 2-D odd parity check by arranging data into a square matrix
c) 8-bit checksum (not Internet checksum)
d) CRC for the generator G = 1001

Problem 2

Derive the efficiency of slotted ALOHA (you must show the steps):

a) Suppose there are N transmitters, each transmitting with probability p in each slot. What is the probability of successfully delivering a packet in a given slot?
b) What is the value of p that maximizes the success probability in a)?
c) What is the limit of the success probability as N goes to infinity?

Problem 3

Repeat a) – c) in Problem 2 for pure (unslotted) ALOHA.

Problem 4

Consider the network in Figure 1. Suppose that host A just connected to the network and has an empty ARP table. Suppose that the ARP tables at other hosts are up to date.

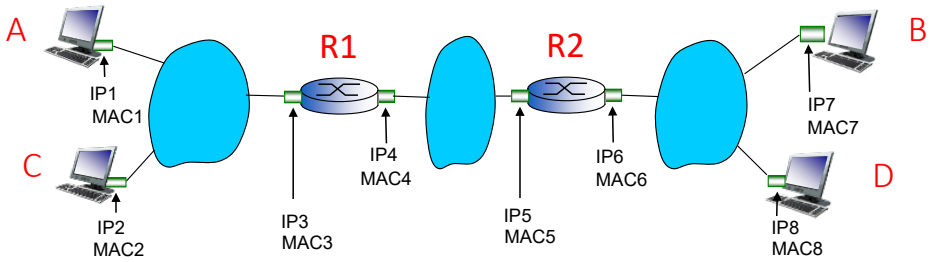

Figure 1. Illustration of Problem 5.

a) How many subnets are there in this network? List the interfaces in each subnet (by their IP address and MAC address).
b) Suppose A is a mobile host (e.g., laptop). How does A obtain its IP address? How does it obtain its MAC address?
c) Suppose B is a server whose hostname is known to A. A wants to send a packet to B. How does A know B' IP address?
d) In the packet sent by A destined to B, what are the values of these header fields: MAC src, MAC dest, IP src, IP dest?
e) How does A know the IP address of the left interface of R1 (i.e., IP3)? How does A know the MAC address of this interface (i.e., MAC3)?
f) Repeat d) for the packet sent by R1 (i.e., the frame containing the A-to-B IP datagram that is sent by R1).

Problem 5

Consider an Ethernet with the topology shown in Figure 2. Suppose that host A sends a frame to host I, and host I responds a frame to host A. Initially, all switch tables are empty. Use the host label to denote its MAC address (e.g., host A's MAC address will be A).

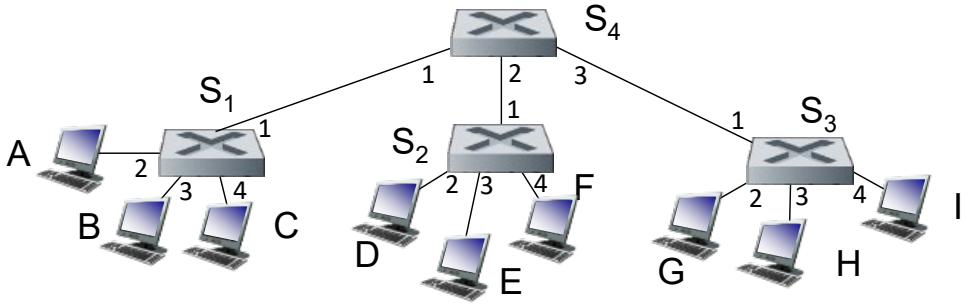

Figure 2. Illustration of a multi-switch Ethernet.

a) Suppose that the frame sent by A arrives at S1 at time t1, S4 at time t2, S2 at time t3, and S3 at time t4. Give the content of the switch tables at S1, …, S4 (each entry contains fields "MAC address", "interface", "time") when the frame arrives at host I.
b) Suppose that the response frame sent by I arrives at S3 at time t5, S4 at time t6, and S1 at time t7. Give the content of the four switch tables when the frame arrives at host A.
c) Is the response frame received by S2? Why?