CS 335, Assignment 5

(Please submit your answers in a single PDF file using UR Courses)

**NOTE: The objective of this assignment is that you study the textbook and the slides, and then answer the questions below yourself. You SHOULD NOT simply copy and paste the answers from the textbook or from the slides.

Total = 45

1. (i) [4] Suppose the information content of a packet is the bit pattern 1110 0110 1001 1101 and an even parity scheme is being used. What would be the value of the field containing the parity bits be for the case of a two-dimensional parity scheme? Your answer should be such that a minimum length checksum field is used.

(ii) [3+3] Consider the 5-bit generator, G=10011. Find the value of R, given

(a) D = 1010101010

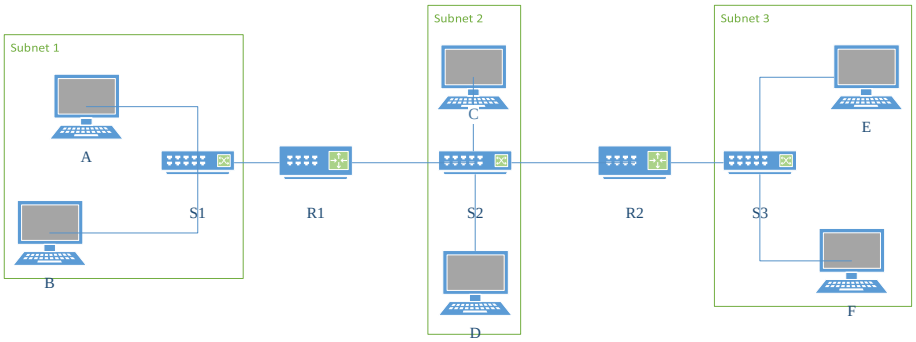
(b) D = 1001010101

2. (i) [5] Given that, when there are N active nodes, the efficiency of slotted ALOHA is $Np(1-p)^{N-1}$, where p is the probability that a node transmits. Find the value of p that maximizes this expression.

(ii) [5] Using the value of p found (i), find the efficiency of slotted ALOHA by letting N approaches infinity. Hints: $(1-1/N)^N$ approaches 1/e as N approaches infinity.

(iii) [5] Consider a broadcast channel with N nodes and a transmission rate of R bps. Suppose the broadcast channel uses polling (with an additional polling node) for multiple access. Suppose the amount of time from when a node completes transmission until the subsequent node is permitted to transmit (that is, the polling delay) is d_{poll} . Suppose that within a polling round, a given node is allowed to transmit at most Q bits. What is the maximum throughput of the broadcast channel?

3. Consider the network below, having 3 subnets, two routers R1 and R2, and three switches S1, S2 and S3.



(i) [5] 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. For Subnet 3 use addresses of the form 192.168.3.xxx.

(ii) [5] Assign MAC addresses to all of the adapters.

(iii) [5] Consider sending an IP datagram from Host E to Host F. Will Host E ask Router R2 to help forward the datagram? Why? In the Ethernet frame containing the IP datagram, what are the source and destination IP and MAC addresses?
(iv) [5] Suppose E would like to send an IP datagram to B, and assume that E's ARP table 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 R2, what are the source and destination IP and MAC addresses?