6장 과제

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P1. Suppose the information content of a packet is the bit pattern 1010 0111 0101 1001 and an even parity scheme is being used. What would 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.

1	0	1	0	0
0	1	1	1	1
0	1	0	1	0
1	0	0	1	0
0	0	0	1	1

P5. Consider the generator, G= 1001, and suppose that D has the value 11000111010. What is the value of R?

```
                  1 1 0 1 1 1 0 0 1 1 0
1 0 0 1     1 1 0 0 0 1 1 1 0 1 0 0 0 0
            1 0 0 1
----------------------------------------
              1 0 1 0
              1 0 0 1
----------------------------------------
                  1 1 1
                  0 0 0
----------------------------------------
                  1 1 1 1
                  1 0 0 1
----------------------------------------
                    1 1 0 1
                    1 0 0 1
----------------------------------------
                      1 0 0 0
                      1 0 0 1
----------------------------------------
                            1 1
                            0 0
----------------------------------------
                            1 1 0
                            0 0 0
----------------------------------------
                            1 1 0 0
                            1 0 0 1
----------------------------------------
                              1 0 1 0
                              1 0 0 1
----------------------------------------
                                  1 1 0 = R
```

P8. In Section 6.3, we provided an outline of the derivation of the efficiency of slotted ALOHA. In this problem we'll complete the derivation.

a. Recall that when there are N active nodes, the efficiency of slotted ALOHA is $Np(1-p)^{N-1}$. Find the value of p that maximizes this expression.

- $E(p) = Np(1-p)^{N-1}$
- $E'(p) = N(1-p)^{N-1} - N(N-1)p(1-p)^{N-2} = N(1-p)^{N-2}(1-Np)$
- $p = \frac{1}{N}$

b. Using the value of p found in (a), find the efficiency of slotted ALOHA by letting N approach infinity. Hint: $(1-\frac{1}{N})^N$ approaches $\frac{1}{e}$ as N approaches infinity.

- $E(p) = N\frac{1}{N}(1-\frac{1}{N})^{N-1} = (1-\frac{1}{N})^{N-1} = \frac{(1-\frac{1}{N})^N}{(1-\frac{1}{N})}$
- $\lim_{N\to\infty}\frac{(1-\frac{1}{N})^N}{(1-\frac{1}{N})} = \frac{\lim_{N\to\infty}(1-\frac{1}{N})^N}{\lim_{N\to\infty}(1-\frac{1}{N})} = \lim_{N\to\infty}(1-\frac{1}{N})^N = \frac{1}{e}$

P11. Suppose four active nodes-nodes A, B, C and D-are competing for access to a channel using slotted ALOHA. 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 slot 2, and so on.

a. What is the probability that node A succeeds for the first time in slot 4?

- $p(1-p)^3(1-p(1-p)^3)^3$

b. What is the probability that some node (either A, B, C or D) succeeds in slot 5?

- $4p(1-p)^3$

c. What is the probability that the first success occurs in slot 4?

- $4p(1-p)^3(1-4p(1-p)^3)^3$

d. What is the efficiency of this four-node system?

- $4p(1-p)^3$

P14. Consider three LANs interconnected by two routers, as shown in Figure 6.33.

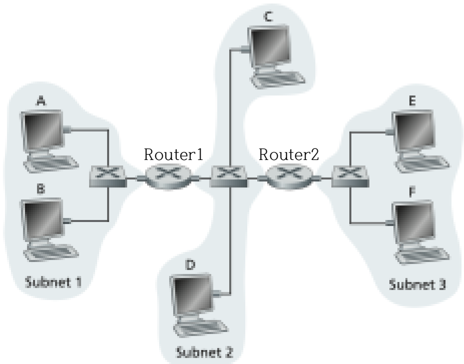

Figure 6.33 • Three subnets, interconnected by routers

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.

- A : 192.168.1.2
- B : 192.168.1.3
- C : 192.168.2.3
- D : 192.168.2.4
- E : 192.168.3.2
- F : 192.168.3.3

b. Assign MAC addresses to all of the adapters.

- A : AA-AA-AA-AA-AA-AA
- B : BB-BB-BB-BB-BB-BB
- C : CC-CC-CC-CC-CC-CC
- D : DD-DD-DD-DD-DD-DD
- E : EE-EE-EE-EE-EE-EE
- F : FF-FF-FF-FF-FF-FF

c. Consider sending an IP datagram from Host E to Host B. Suppose all of the ARP tables are up to date. Enumerate all the steps, as done for the single-router example in Section 6.4.1.

1. Host E에서 Router2로 데이터그램 전송
2. Router2에서 Router1로 전송
3. Router1에서 Host B로 전송

d. Repeat (c), now assuming that the ARP table in the sending host is empty (and the other tables are up to date).

1. Host E가 ARP 요청 전송
2. Router2가 ARP 응답
3. Host E에서 Router2로 데이터그램 전송
4. Router2에서 Router1로 전송
5. Router1에서 Host B로 전송

P17. Recall that with the CSMA/CD protocol, the network adapter waits K • 512 bit times after a collision, where K is drawn randomly. For K = 115, how long does the adapter wait until returning to Step 2 for:

a. a 10 Mbps broadcast channel?

- $10Mbps = 10^7 bits/\sec$
- $T = \frac{K \cdot 512 bits}{10^7 bits/\sec} = \frac{115 \cdot 512}{10^7}\sec = \frac{58880}{10^7}\sec = 0.005888\sec = 5.888ms$

b. a 100 Mbps broadcast channel?

- $100Mbps = 10^8 bits/\sec$
- $T = \frac{K \cdot 512 bits}{10^8 bits/\sec} = \frac{115 \cdot 512}{10^8}\sec = \frac{58880}{10^8}\sec = 0.0005888\sec = 0.5888ms$