Homework Assignment

2018037356 – 안동현

Chapter2

p 2-3

L2, L3

p 2-4

UDP와 TCP는 다른 프로토콜이라서 코드를 교체하는 작업이 필요합니다.

p 2-6

150/250 = 0.6

p 2-8

a. L2, L3

b. L4

c. L5

p 2-9

장점: 많은 정보를 한번에 보내는 것이 가능하다.

단점: 많은 정보를 한번에 보낼수록 오류가 생기기 쉽고 드랍시 큰 용량을 다시 보내야 한다.

p 2-13

a. L4

b. L2

c. L1

Chapter3

p 3-4

1600 * 800 * 1024 = 1310720000 bits = 1.3107 Gbit

p 3-5

5000000 * log2(1 + 2000) = 54832500.0 bps = 54.8325 Mbps

p 3-7

a. 1000 bps

b. 0.5 bps

c. 0.2 mbps

p 3–17

a.

10log10(x) = 40, x = 10^4

30000 * log2(1 + 10000) = 398635.699 = 398.6 kbps

b.

10log10(x) = 4, x = 10^0.4

100000 * log2(1 + 2.5189) = 100000 * 1.8151 = 181510.0 = 181.5 kbps

c.

10log10(x) = 20, x = 10^2

1000000 * log2(1 + 100) = 1000000 * 6.6582 = 6658200.0 = 6.6582 Mbps

p 3-18

100 kbps 당 50, 150, 250 kHz의 대역폭이 필요하니

100 * 120 = 12000 = 12kbps

100 * 40 = 4000 = 4kbps

100 * 24 = 2400 = 2.4kbps 가능

p 3-19

signal = 200 mW, 20devices, each noise = 20 * 10^-3 mW

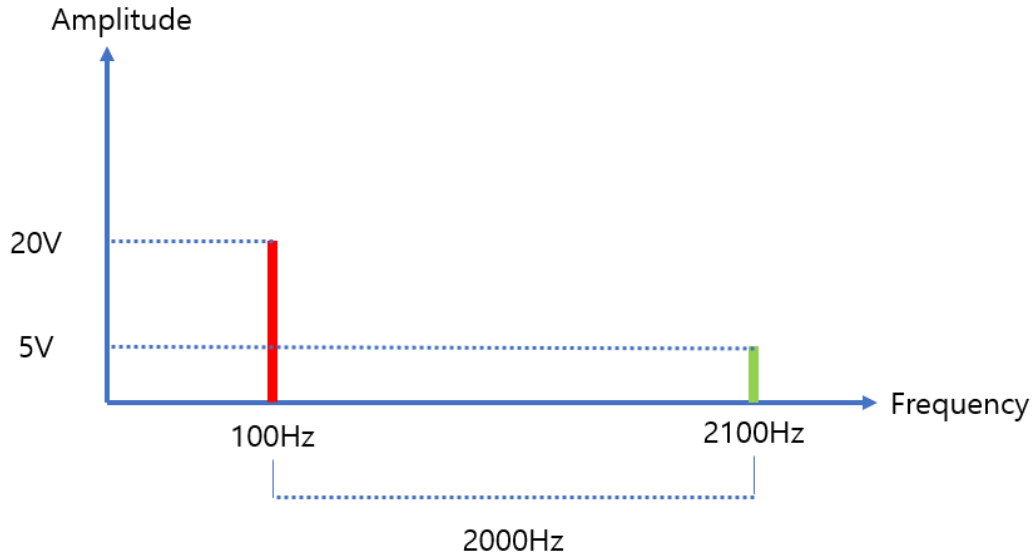
tot = 20 * 20 * 10^-3 = 400 * 10^-3

signal / tot = 200

따라서 SNR = 200

SNRdb = 10log10(200) = 2.301029995664 * 10 = 23.0103유

p 3-25



p 3-29

최대 SNR은 노이즈가 아예 없으므로 무한대 이고 그에 따라 SNRdb 역시 무한대이다.

최소 SNR은 노이즈가 있는 채널이므로

100000 = 4000 * log2(1 = SNR)

SNR = 2^25 = 33554432

SNRdb = 10log10(33554432) = 10 * 7.5257498916 = 75.2575유

Chapter4

p 4-3

Bandwidth (B) =200 KHz

Level of signaling (L) =4

N = 2 * B * log2(L) = 800 kbps

p 4-5

Bandwidth = 300000 Hz

a.

2 * 300000 = 600000 samples / s

b.

Lowest frequency=100 KHz

f = 300 + 100 = 400KHz

= 400000 Hz

2 * 400000 = 800000 samples / s

p 4-7

B = 2 MHz

a. NRZ-L

B = N/2

N = B * 2 = 2 * 2 = 4

4Mbps

b. Manchester

B = N/1

N = B*1 = 2 * 1 = 2

2Mbps

c. MLT-3

B = N/3

N = B * 3 = 2 * 3 = 6

6Mbps

d. 2B1Q

B = N/4

N = B * 4 = 2 * 4 = 8

8Mbps

p 4-8

a.

B = 300KHz = 300000Hz

f = 2 * 300 = 600000 samples / s

log2(1024) = n = 10 bit / samples

f * n = 600000 * 10 = 6Mbps

b.

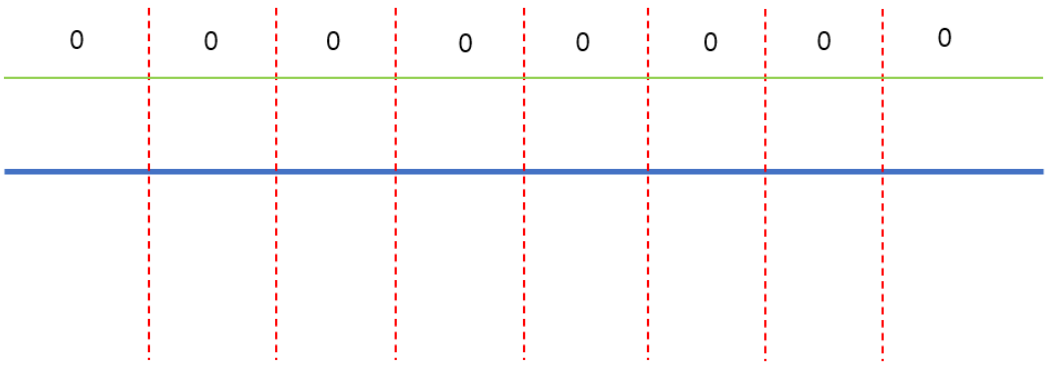
SNRdb = 6.02n + 1.76db = 6.02 * 10 + 1.76 = 61.96db

c.

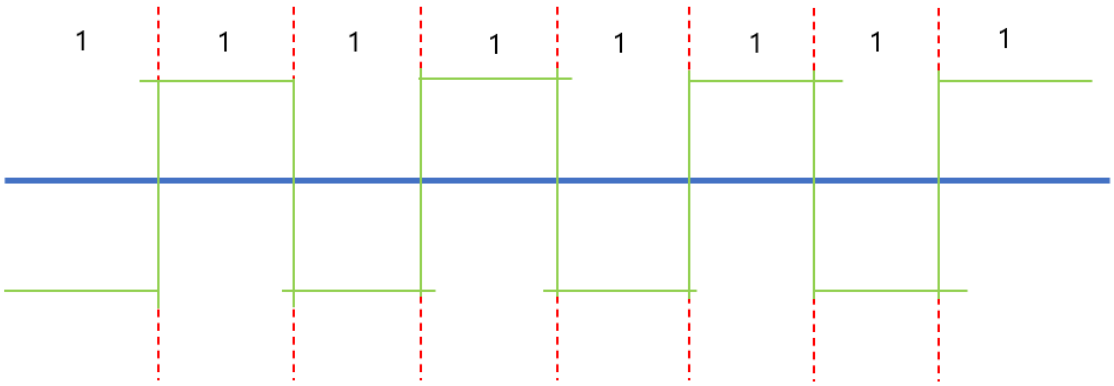
10 * 300 = 3MHz

p 4-10

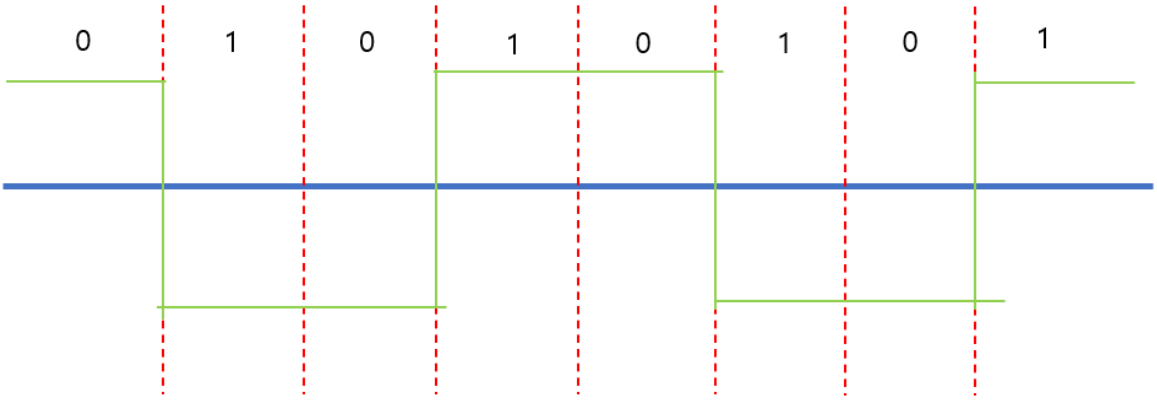
a. 00000000



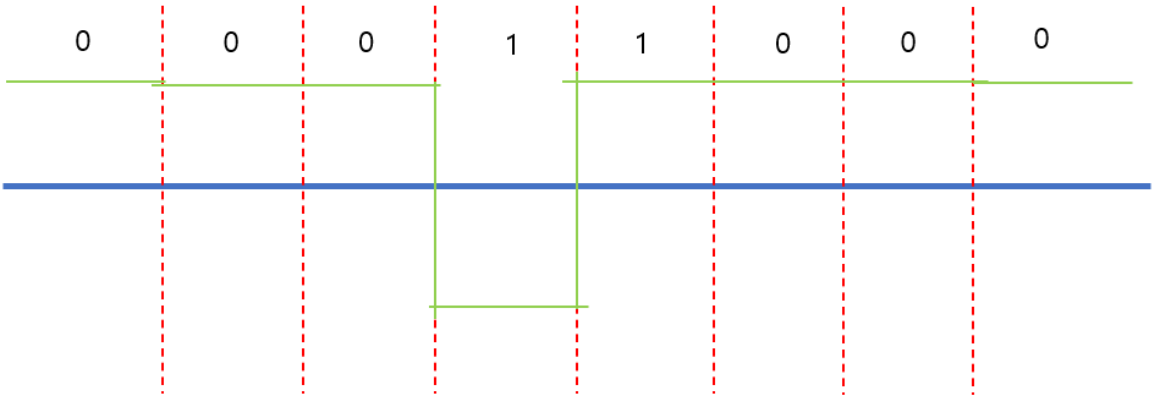
b. 11111111



c. 01010101



d. 00011000



평균: (0 + 7 + 4 + 2) / 4 = 13/4 = 3.25

B = (3.25/8)N

0.406이 나온다. 실제 값은 표를 보면 0.5이다.

p 4-11

a.

(1/2) * 1000 * 1 = 500Kbaud

b.

(1/2) * 1 * 2 = 1Mbaud

c.

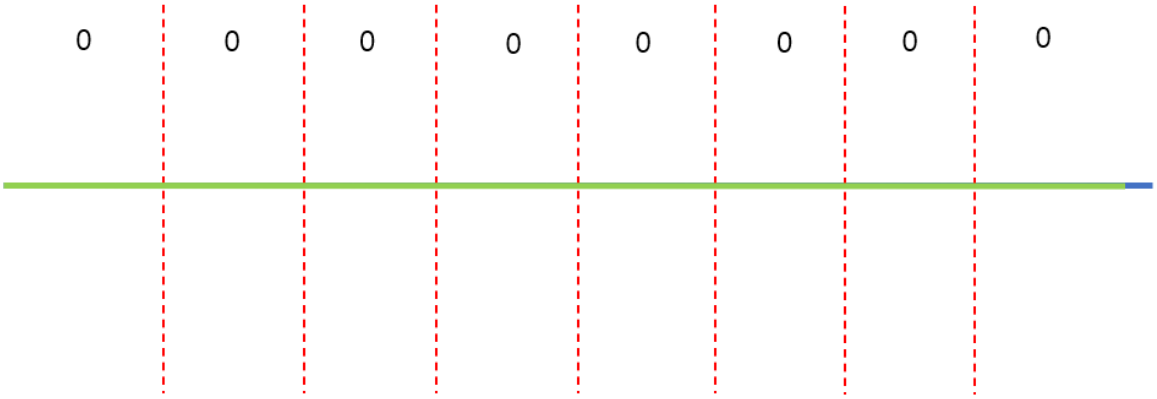
(1/2) * 1000 * (1/2) = 250Kbaud

d.

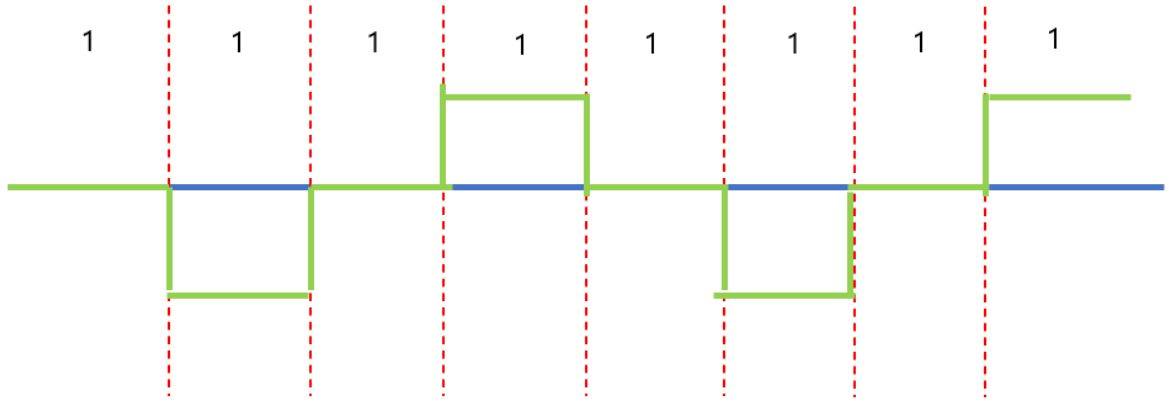
(1/2) * 1000 * (3/4) = 375 Kbaud

p 4-16

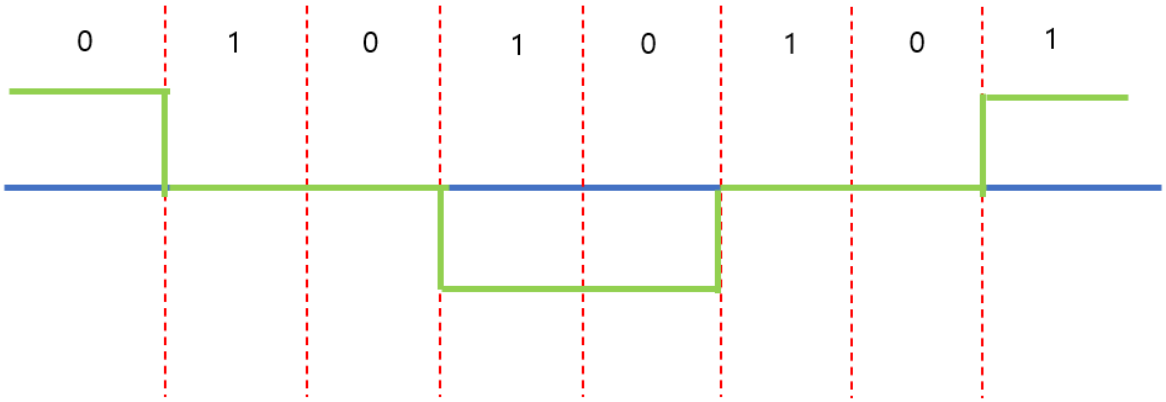
a. 00000000



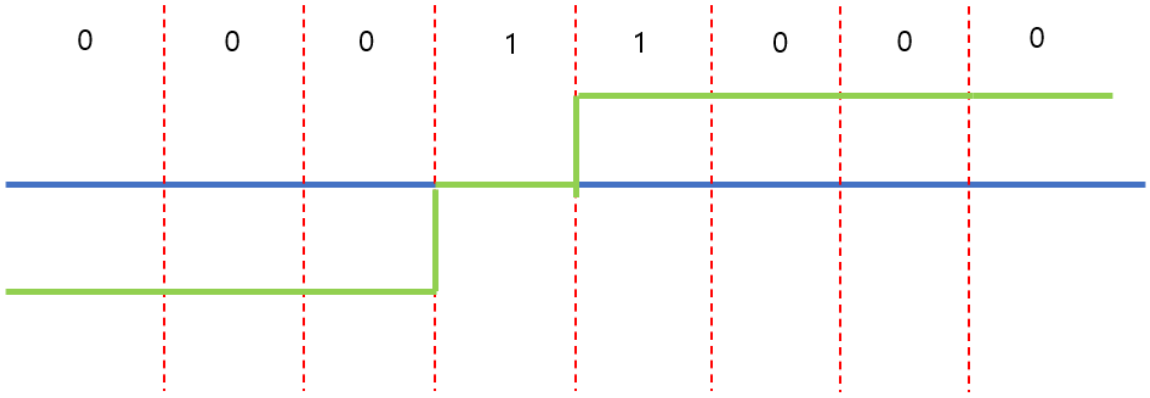
b. 11111111



c. 01010101



d. 00011000



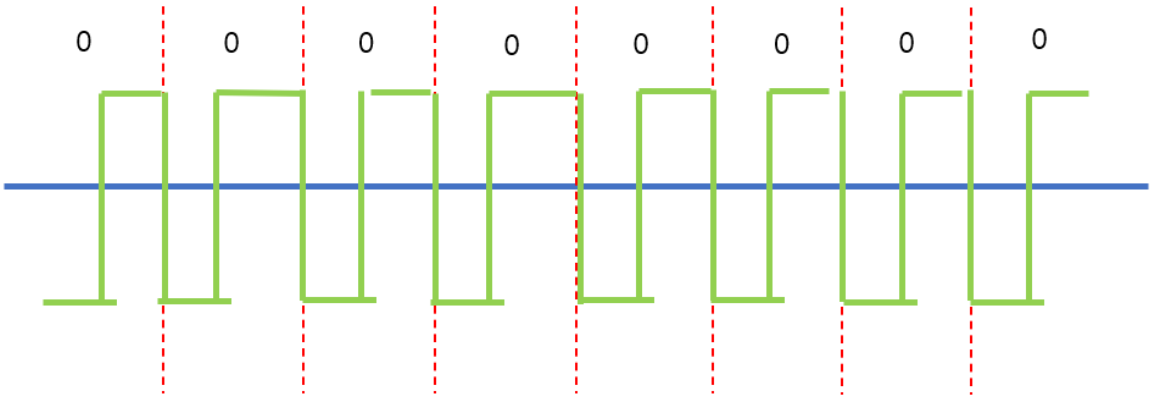
평균 : (0 + 7 + 4 + 2) / 4 = 13/4 = 3.25

B = (3.25/8)N

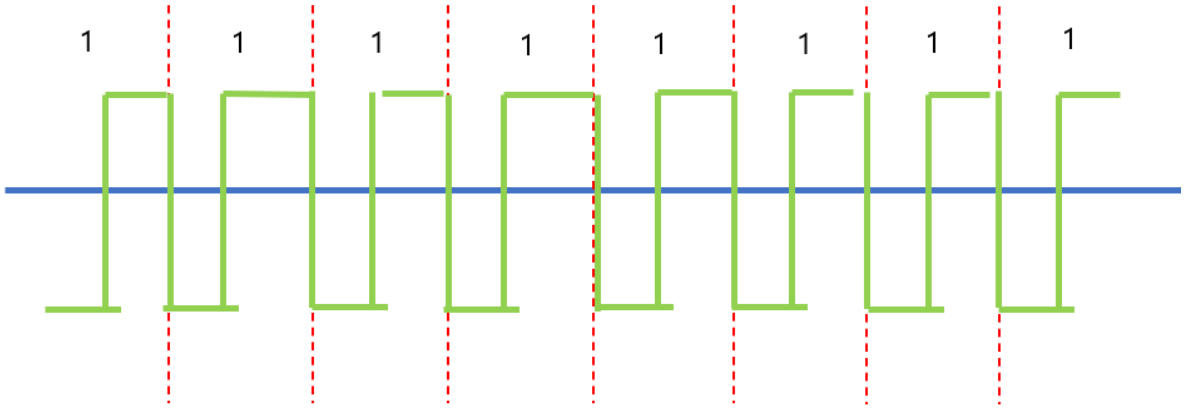
0.406N이 나온다. 실제 값은 표를 보면 0.33333...이다.

p 4-18

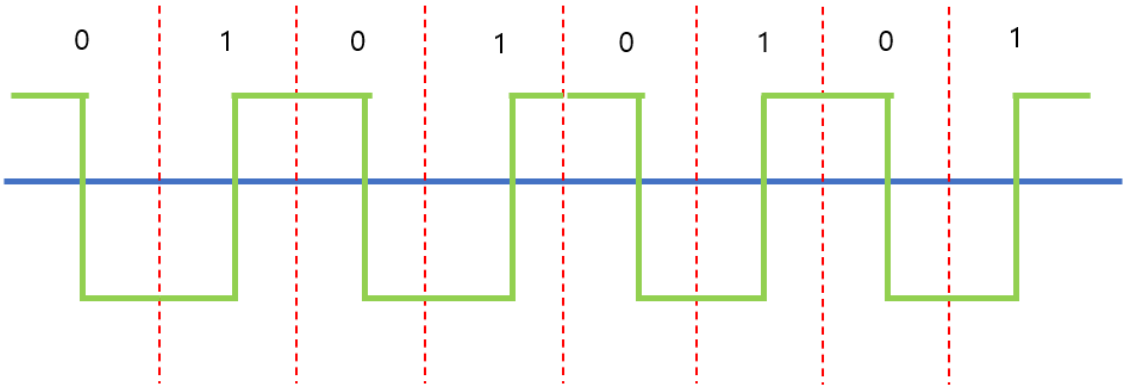
a. 00000000



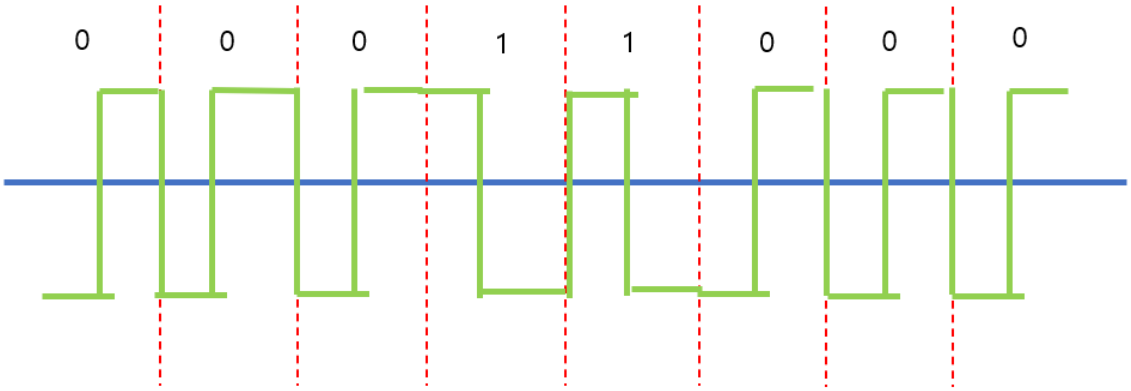
b. 11111111



c. 01010101



d. 00011000



평균: (15 + 15 + 8 + 13) / 4 = 51/4 = 12.75

12.75/8 = 1.5937N

표에서는 N이므로 0.6정도 차이가 난다.

Chapter5

p 5-1

a.

(1+1) * 6000 * 1

= 12000 Hz

b.

2 * 6000 + 4000 = 16000 Hz

c.

2 * 6000 = 12000 Hz

d.

2 * 6000 * (1/4) = 3000 Hz

p 5-3

a.

2 * 5 = 10 KHz

b.

2 * (1 + 5) * 5 = 60 KHz

c.

2 * (1 + 1) * 5 = 20 KHz

p 5-5

a.

L = 4

따라서

2log2(2) = 2 bits / baud

b.

L = 8

따라서

3log2(2) = 3 bits / baud

c.

L = 4

따라서

2log2(2) = 2 bits / baud

d.

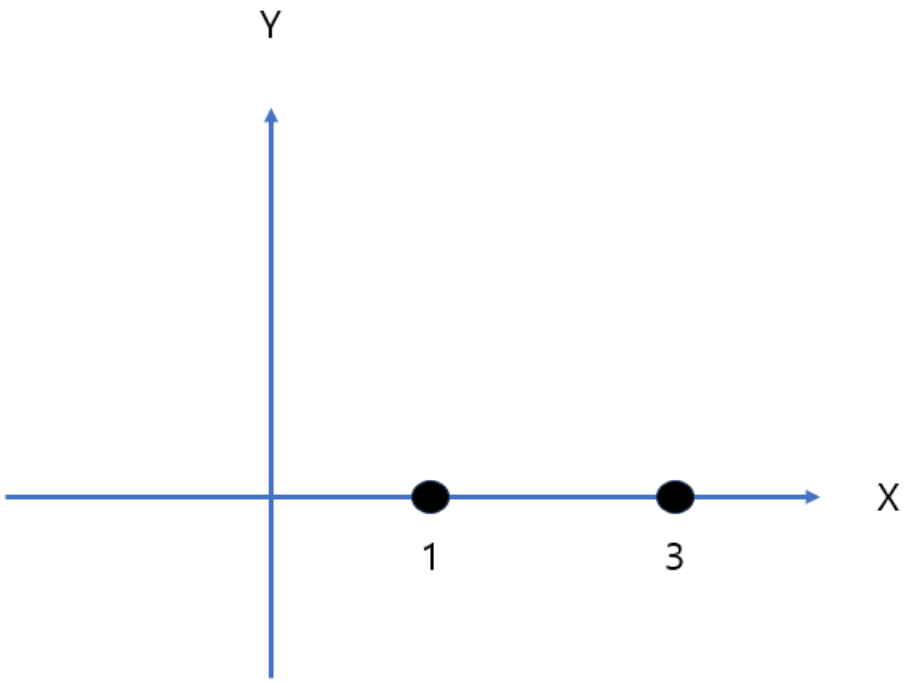
L = 128

따라서

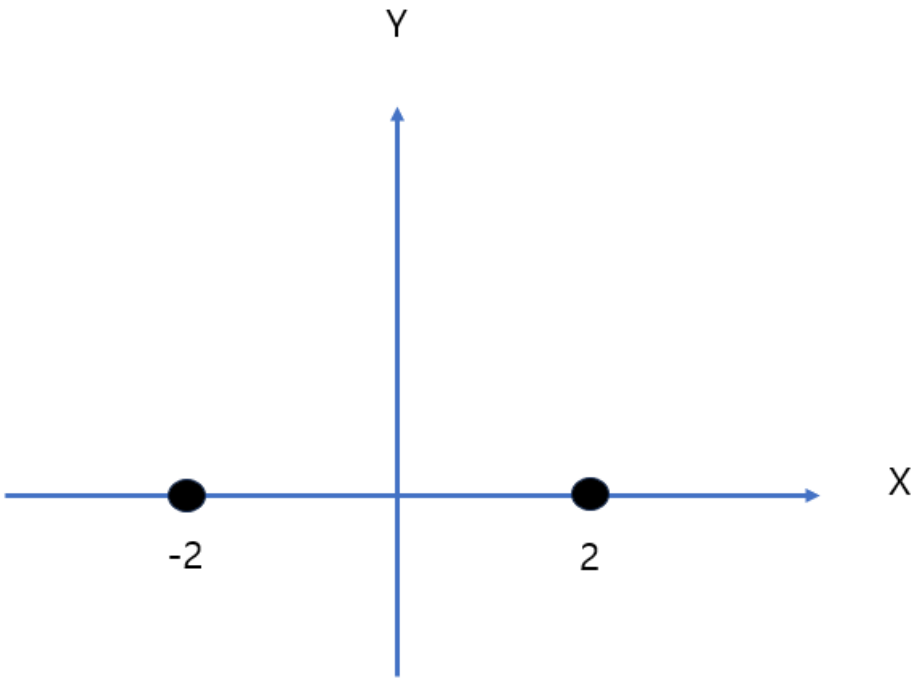
7log2(2) = 7 bits / baud

p 5-6

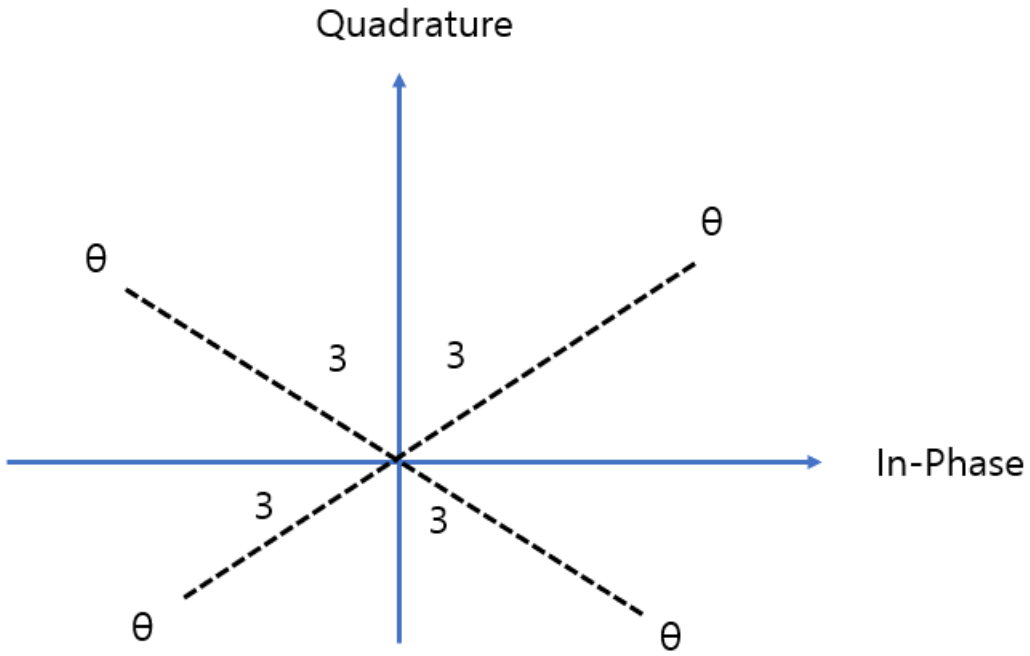
a.



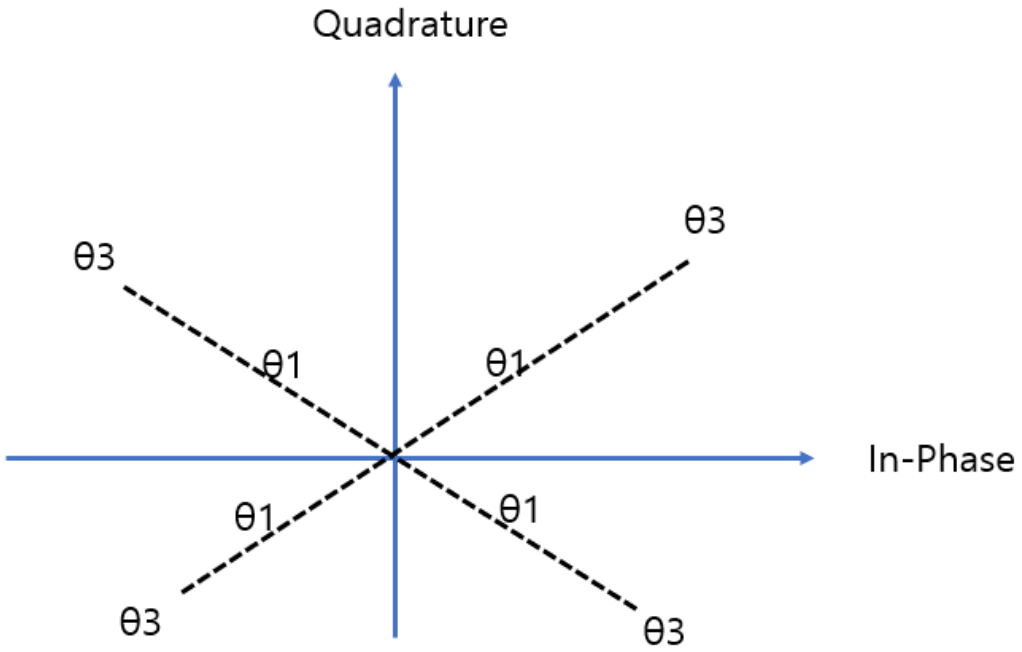
b.



c.



d.



p 5-7

a.

3000 * 1 = 3000 baud

b.

2000 * 1 = 2000 baud

c.

4000 * (1/2) = 2000 baud

d.

36000 * (1/6) = 6000 baud

p 5-9

B = (1+d) * S, d = 0

S = N * (1/r) ,N = 10Mbps

따라서

B = (1 + d) * N * (1/r) 이므로

r = (1 + d) * N * (1/B)

이때 B 는 100KHz이므로

r = (1 + 0) * 10Mbps * (1 / 100KHz)

= 10

이때 r = log2(L) 이므로

L = 2^10 이 된다.

이것은 1024 이므로

1024개가 필요하다.