Spring - 23

1. sender:

$(3046)_{16}, (ABDC)_{16}, (2B5)_{16}, (E30)_{16}$

sum After 16 bit conversion,

$(3046)_{16} \Rightarrow (3046)_{16}$

$(ABDC)_{16} \Rightarrow (ABDC)_{16}$

$(2B5)_{16} \Rightarrow (02B5)_{16}$

$(E30)_{16} \Rightarrow (0E30)_{16}$

$(ED07)_{16}$

After 1's compliment $= (12F8)_{16}$

checksum = 12F8

Receiver:

~~that~~

After changing the data and 16 bit conversion the sum is,

$(3047)_{16} \Rightarrow (3047)_{16}$

$(ABDC)_{16} \Rightarrow (ABDC)_{16}$

$(2B4)_{16} \Rightarrow (02B4)_{16}$

$(E30)_{16} \Rightarrow (0E30)_{16}$

$$\text{sum} = (ED07)_{16}$$

$$\text{checksum} \underset{(+)}{=} (12F8)_{16}$$

$$(FFFF)_{16}$$

After 1's compliment $= (0000)_{16}$

There is error as data changed but receiver can't detect error.

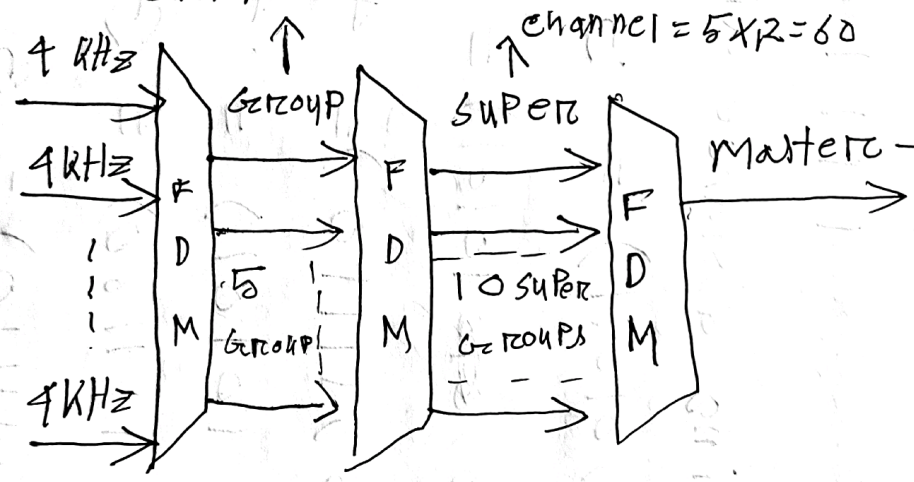
Band = 12X4 + 11X1 = 59kHz

channel = 12

Band = 5X59 + 4X5 = 315KHZ

channel = 5X12 = 60

(2)



Band = 10X315 KHZ + 9X10

= 3240 kHz

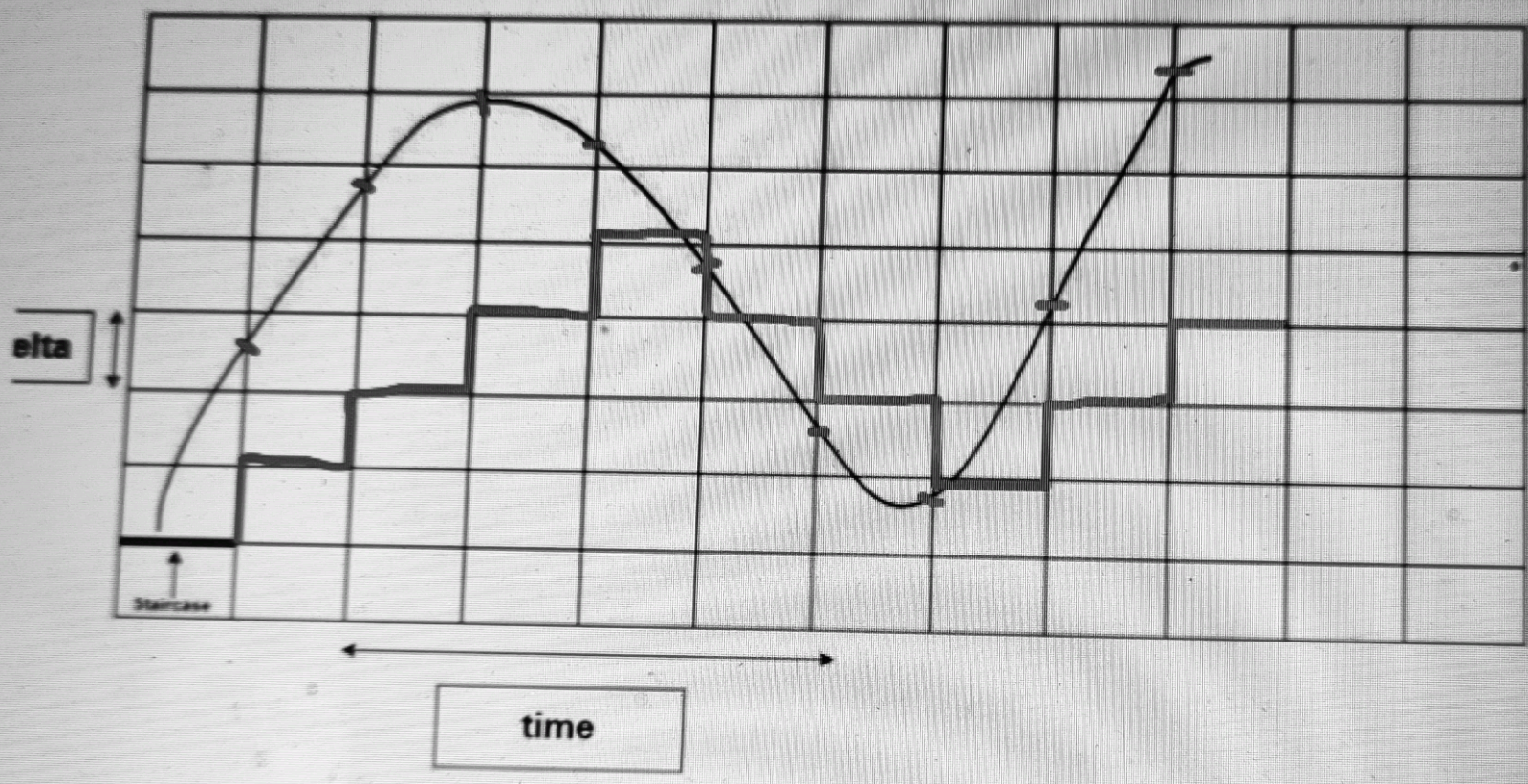
channel = 60 X 10 = 600 channel

G.B = 1kHz

G.B = 5KHZ

GB = 10kHZ

Follow me



1 1 1 1 1 0 0 0 1 1

③ 0 1 1 1 1 0 0 0 1 1

④ ⓒ

Data	code
0 0	0 0 0 0 0
0 1	0 1 0 1 1
1 0	1 0 1 0 1
1 1	1 1 1 1 0

All the hamming distance are,

d(00000, 01011) = 3

d(00000, 10101) = 3

d(00000, 11110) = 4

d(01011, 10101) = 4

d(01011, 11110) = 3

d(10101, 11110) = 3

$\therefore d_{min} = 3$

we know,

$d_{min} = s + 1$ [s = detection of error]

$\Rightarrow s = d_{min} - 1$

$= 3 - 1$

$= 2$

$\therefore$ The code guarantees the error detection upto 2 errors

Again,

$d_{min} = 2t + 1$ [t = correction of error]

$\Rightarrow t = \frac{d_{min} - 1}{2}$

$= \frac{3 - 1}{2} = 1$

$\therefore$ It ~~can~~ code can correct upto 1 error.

5(a) We know,

$$N = \log_2\left(\frac{B_{SS}}{B}\right)$$

Where,

N = minimum number of bits in the PN sequence

B_{SS} = Bandwidth of spread signal

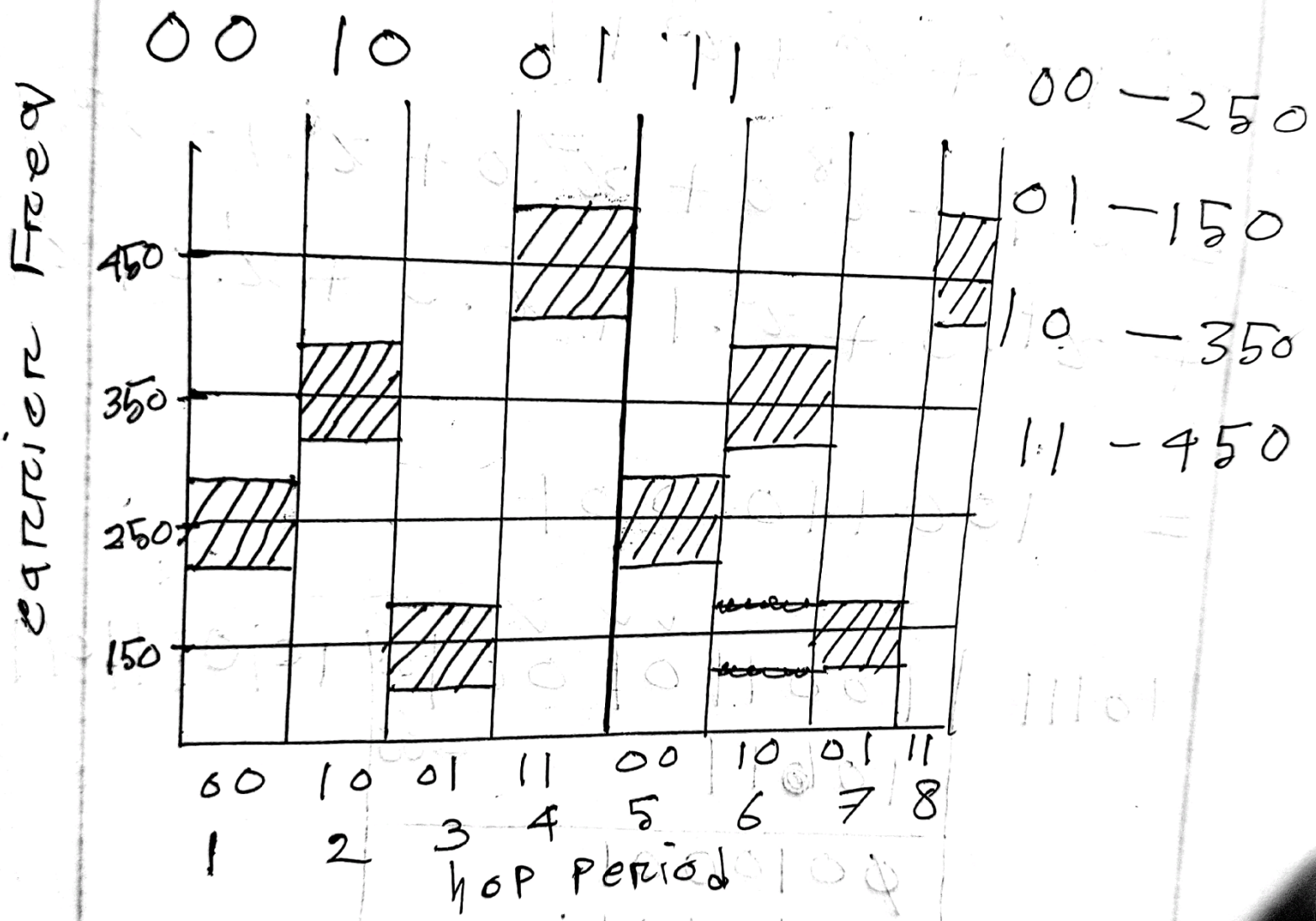
B = Bandwidth of particular signal.

$$\therefore N = \log_2\left(\frac{250\,KHz}{5 \times 10^{-3}\,KHz}\right)$$

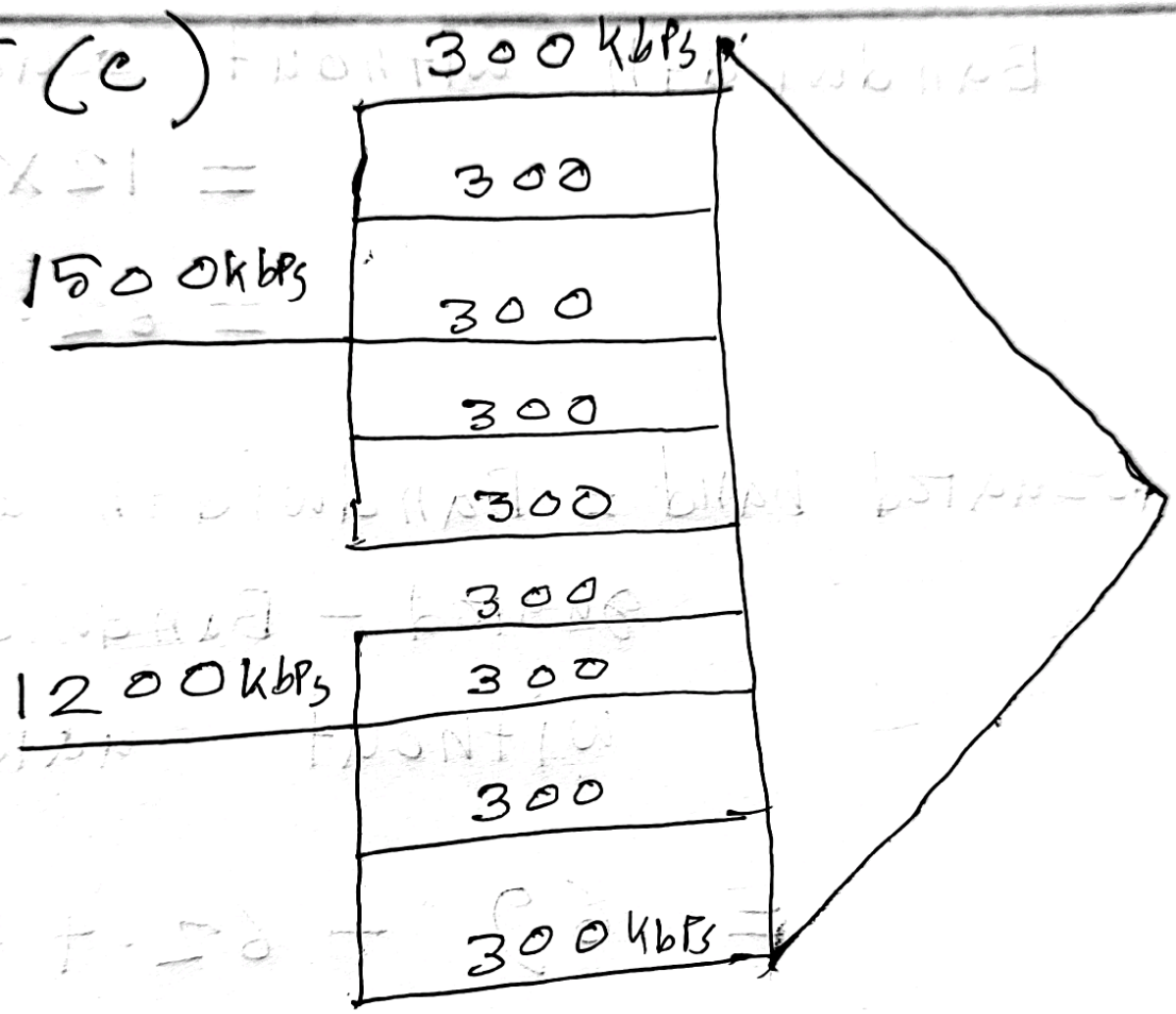
$$= \log_2(50000)$$

$$= 15.60$$

$\therefore$ Minimum bits of 16 are required in the PN sequence to achieve FHSS.


00 10 01 11
00 — 250
01 — 150
10 — 350
11 — 450
carrier Freq
450
350
250
150
00 10 01 11 00 10 01 11
1 2 3 4 5 6 7 8
hop period

5 (c)


300 kbps
300
1500 kbps
300
300
300
300
1200 kbps
300
300
300 kbps