

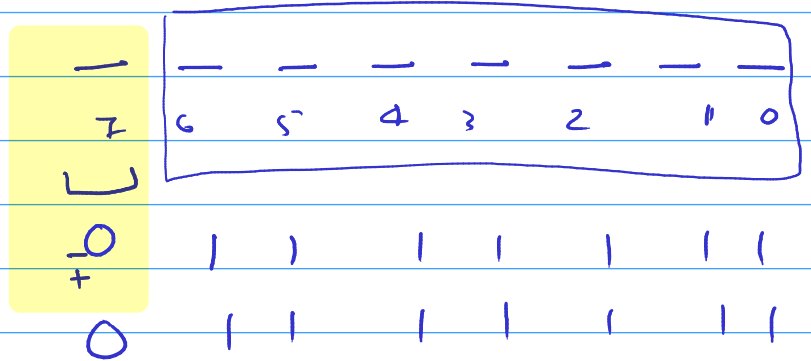
Lecture # 3

14 →

16 bit

— — — — —

+ addition
- subtraction



127 → $2^7 - 1$ →

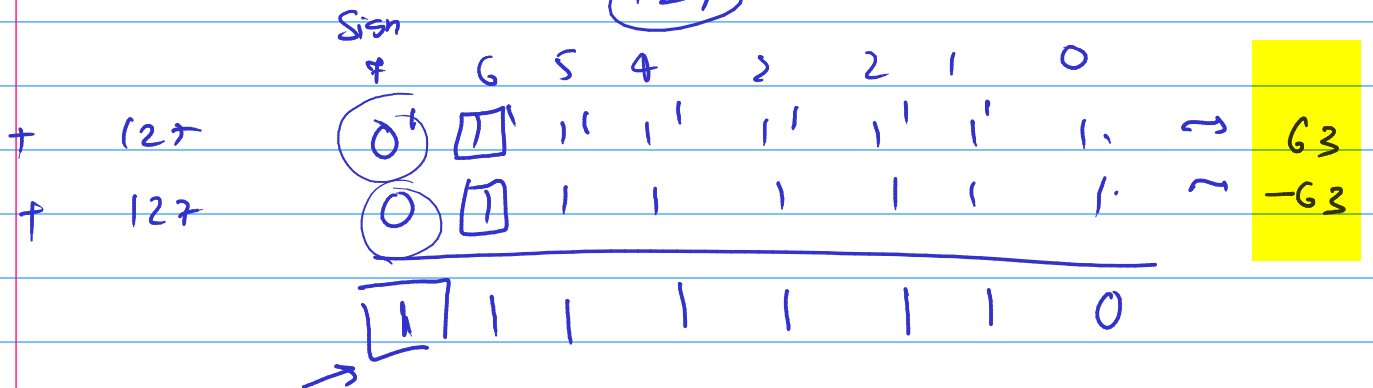
127

$2^4 - 1 = 15 \rightarrow 1111$

$2^3 - 1 = 7 \rightarrow 111$

$2^2 - 1 = 3 = 11$

(127)



63
-63

$$\begin{array}{r}
 \rightarrow \quad \begin{array}{c} 14 \\ -7 \\ \hline \end{array} \rightarrow \begin{array}{c} \boxed{0} \quad 1 \quad 1 \quad 1 \quad 0 \\ \textcircled{1} \quad 1 \quad 0 \quad 0 \quad 1 \\ \hline 0 \quad 0 \quad 1 \quad 1 \quad 1 \end{array} \leftarrow -7
 \end{array}$$

$$\begin{array}{r}
 0 \quad 0 \quad 1 \quad 1 \quad 1 \quad 7 \\
 1 \quad 1 \quad 0 \quad 0 \quad 0 \quad 1's \\
 1 \quad 1 \quad 0 \quad 0 \quad 1 \quad \underline{\underline{2's}}
 \end{array}$$

$$9 \times (-1) = -9$$

$$01001 \rightarrow$$

$$10110$$

$$+ 1$$

$$\begin{array}{r}
 10111 \\
 01000 \\
 + 1 \\
 \hline
 \end{array}$$

$$\rightarrow -9 \times -1 = 9$$

$$01001$$

$$\underline{\underline{\quad}}$$

$$\rightarrow 9 \rightarrow$$

$$01001$$

$$\textcircled{1}1001$$

$$10 \rightarrow 01010$$

$$-9 \quad 11001$$

$$\boxed{00011} \quad \textcircled{3}$$

#

Signed



i/p \rightarrow bits

+

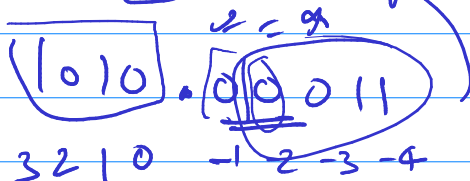
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— — — — —

#

10 . 12

$$.12 \times 2 = 0.24$$



$$0.24 \times 2 = 0.48$$

$$0.48 \times 2 = 0.96$$

$$0.96 \times 2 = 1.92$$

$$0.92 \times 2 = 1.84$$

$$0.5 \times 2 = 1.0$$

$$1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 +$$

$$2^{-1} \times 0 + 2^{-2} \times 0 + 2^{-3} \times 0 + 2^{-4} \times 1$$

$$= 10$$

-10.12



1.111011

-10.12

.11
.11

0.11
.12
 .23



0.11



0.12

$$0.11 \times 2 = 0.22$$

$$0.22 \times 2 = 0.44$$

$$0.44 \times 2 = 0.88$$

$$0.88 \times 2 = 1.76$$

$$0.76 \times 2 = 1.52$$

0.999... 5

$$0.12 \times 2 =$$

- (0.12)

0|0|0.060|1|1 +ve
 1|0|0|1.11|0|0 $\rightarrow 1.5$

+ 1 + 2's =

1|0|0|1.11|0|1

$$\begin{array}{r} 11.04 \\ - 10.12 \\ \hline 0.92 \end{array}$$

$$\begin{array}{r} 11011 \\ \times 0 \\ \hline 00000 \end{array}$$

$$\begin{array}{r} 11011 \\ \times 1 \\ \hline 11011 \end{array}$$

$$\begin{array}{r} 11011 \\ \times \boxed{10} \quad \boxed{2} \\ \hline 00000 \\ 11011 \\ \hline 110110 \end{array}$$

$$\begin{array}{r} 11110 \\ \times 10 \\ \hline 111100 \end{array}$$

$$\begin{array}{r} 1111 \times 8 \\ \hline 1000 \end{array}$$

$$\begin{array}{r} 1110 \\ \hline \end{array}$$

8

#

73

$$11 \overline{) 1101} (1$$

#

$$\boxed{4} \boxed{3} \rightarrow$$

$$111;011 \rightarrow$$

$$\begin{array}{r} \text{d} \quad \textcircled{9} \rightarrow \\ \underline{\underline{10}} \end{array}$$

$$\begin{array}{r} 1001 \\ \underline{\underline{2}} \\ 1010 \\ 1011 \\ 1100 \end{array}$$

F A

1111 1010

$$\begin{array}{cc} \overline{1} & \overline{1} & \overline{1} & \overline{1} \\ \overline{1} & \overline{1} & \overline{1} & \overline{1} \end{array}$$

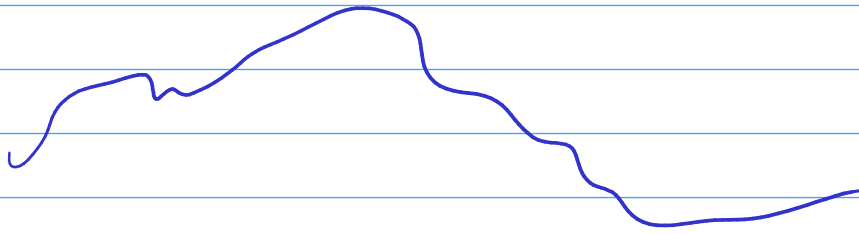
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

$$\boxed{16}$$

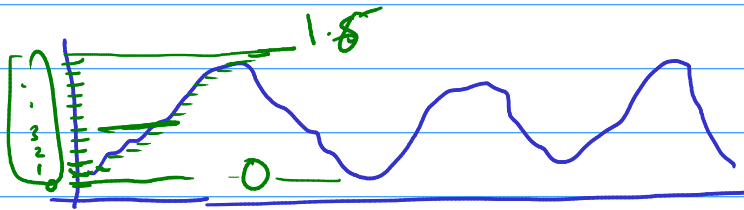
Ele.

#

Voice \rightarrow [Sensor.] \rightarrow

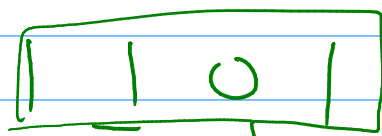
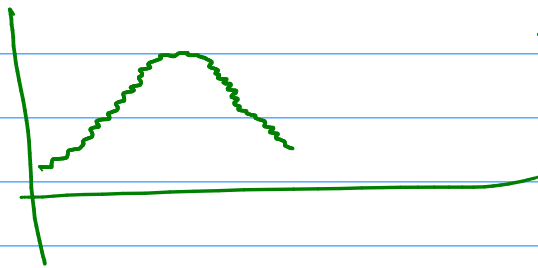


256



0 - 0.1 \rightarrow 1
0.1 - 0.2 \rightarrow 2

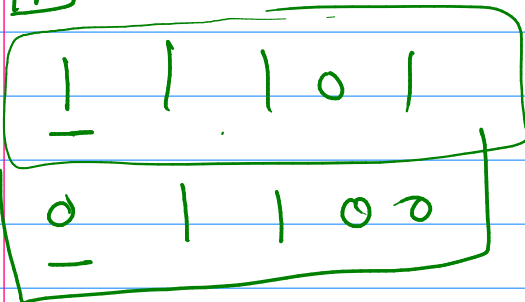
0110 \rightarrow 6



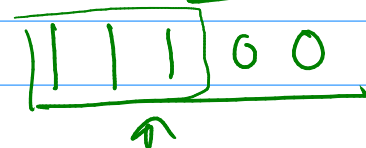
Tx

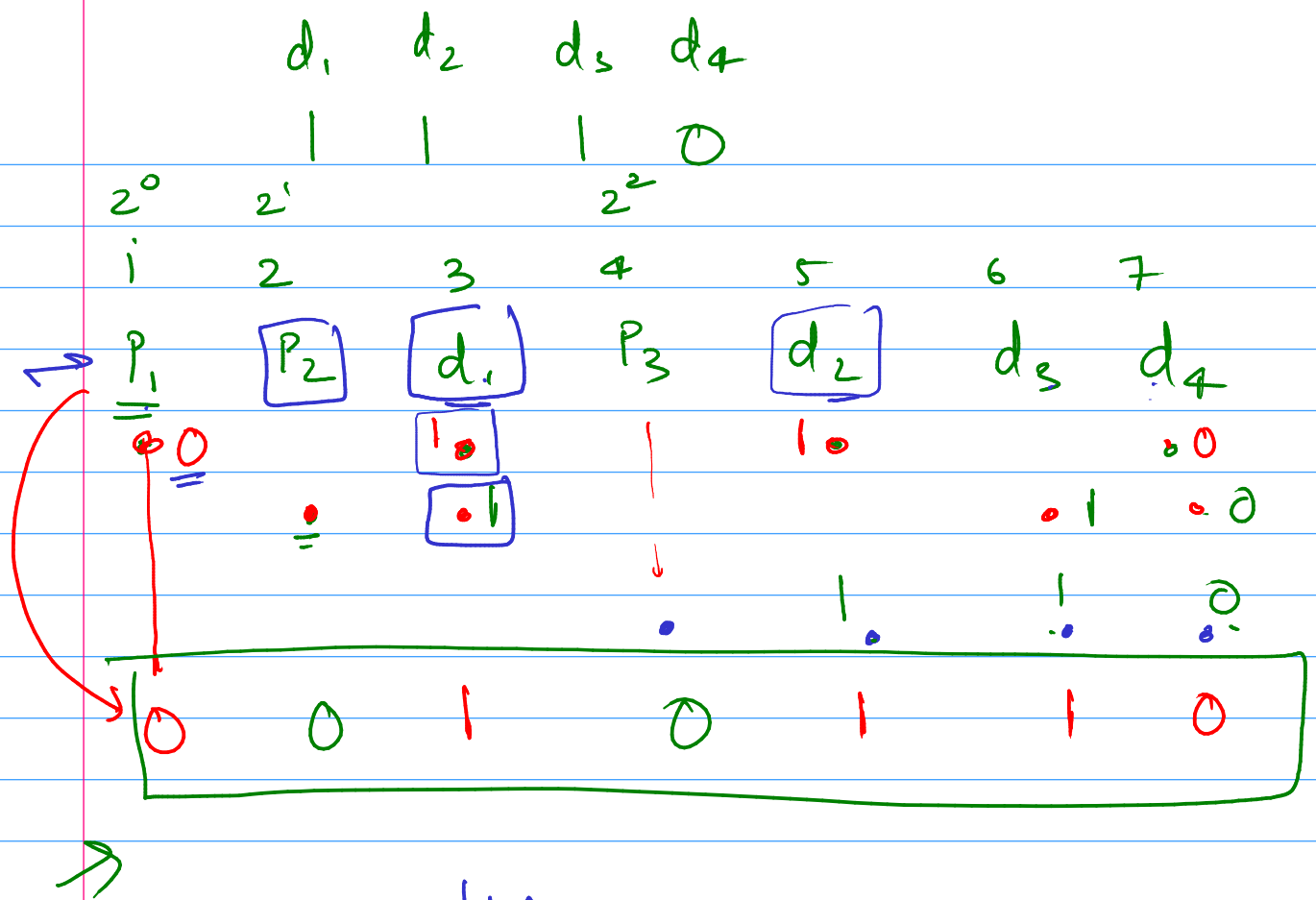
1011

P



RE





Hamming Code

Diagram illustrating the calculation of the number of parity bits (R) required for a given data length (n).

Given: $n = 3$ (data length).

Formula: $2^R - R - 1 \geq n$

Calculation:

$$2^R - R - 1 \geq 3$$

$$2^R - R - 1 = 3$$

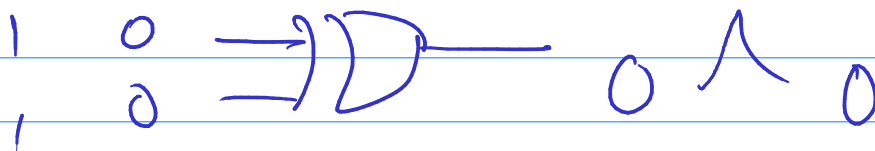
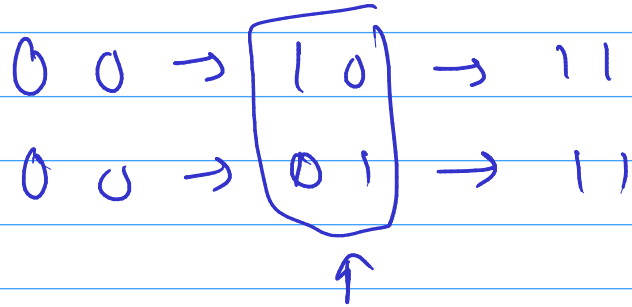
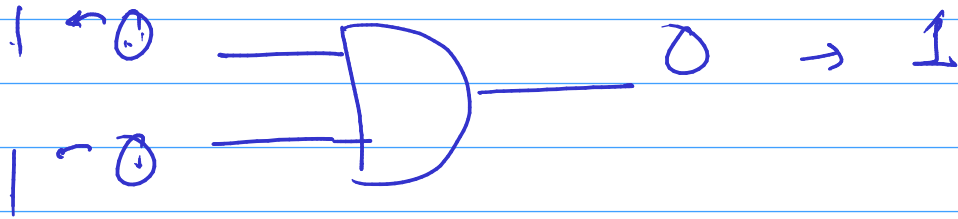
$$2^R - R = 4$$

Solving for R , we find $R = 3$.

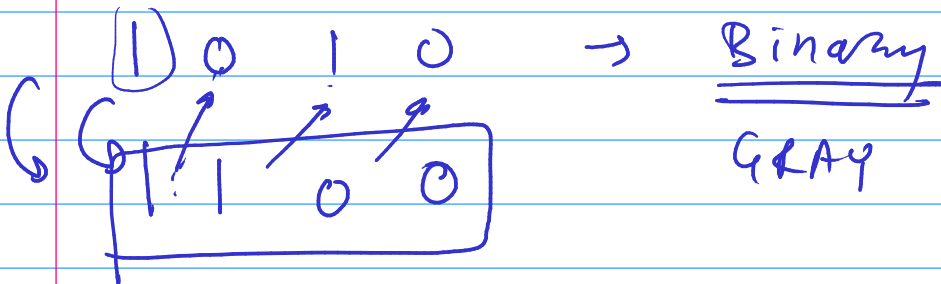
Final Data: $\rightarrow (2^R - R - 1) + R$

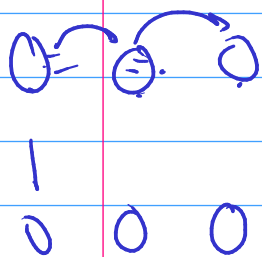
$$= 2^R - 1$$

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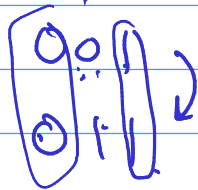
GRAY Codes

$$\begin{array}{r} 00 \\ 01 \\ 10 \\ \hline 111 \end{array}$$





$$000 \rightarrow 000$$



$$\underline{010}$$

$$001$$

$$\leftarrow 010$$

$$\leftarrow 011$$

$$010$$

$$100$$

$$101$$

$$110$$

$$111$$

