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- CSE232 -

Homework 1
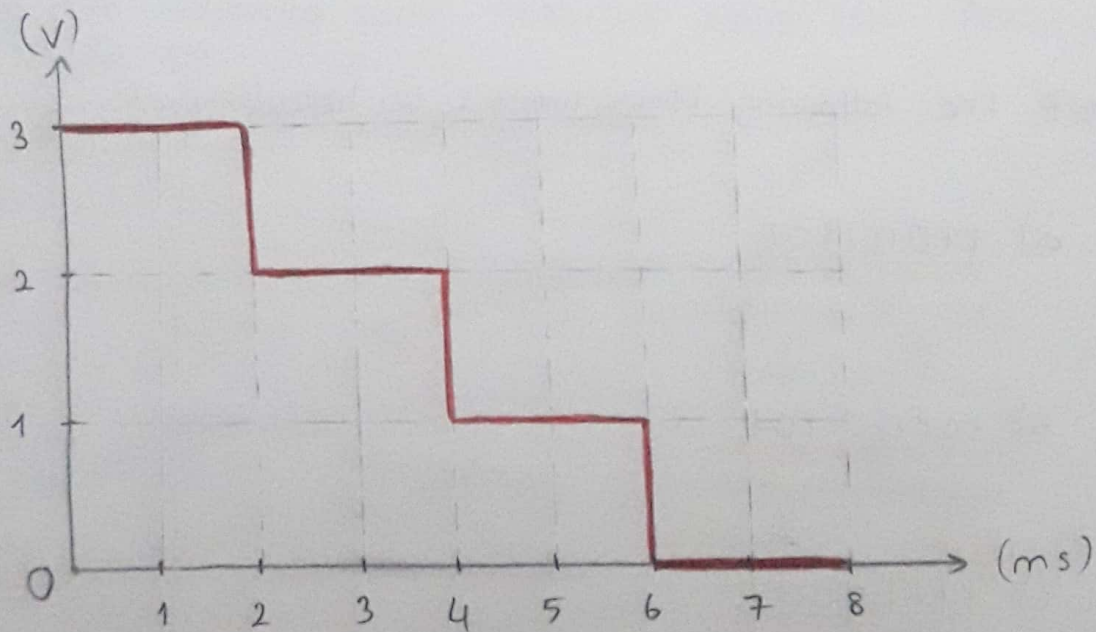
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① Assume that 0V is encoded as 00, 1V as 01, 2V as 10, and 3V as 11. You are given a digital encoding of an audio signal as follows: 1111010010100000. Plot the re-created signal with time on the x-axis and voltage on the y-axis. Assume that each encoding's corresponding voltage should be output for 1 millisecond.

11, 11, 10, 10, 01, 01, 00, 00
3V   3V   2V   2V   1V   1V   0V   0V

② Convert the following binary numbers to decimal numbers:

a) $\overset{2^5}{0}\overset{2^4}{0}\overset{2^3}{0}\overset{2^2}{0}\overset{2^1}{1}\overset{2^0}{1}$

$0\cdot 2^5 + 0\cdot 2^4 + 0\cdot 2^3 + 0\cdot 2^2 + 1\cdot 2^1 + 1\cdot 2^0$
$\quad 0 \;+\; 0 \;+\; 0 \;+\; 0 \;+\; 2 \;+\; 1 \;=\; \underline{\underline{3}}$

b) 1111

$1\cdot 2^3 + 1\cdot 2^2 + 1\cdot 2^1 + 1\cdot 2^0$
$\quad 8 \;+\; 4 \;+\; 2 \;+\; 1 \;=\; \underline{\underline{15}}$

c) 11110

$1\cdot 2^4 + 1\cdot 2^3 + 1\cdot 2^2 + 1\cdot 2^1 + 0\cdot 2^0$
$\quad 16 \;+\; 8 \;+\; 4 \;+\; 2 \;+\; 0 \;=\; \underline{\underline{30}}$

d) 111100

$1\cdot 2^5 + 1\cdot 2^4 + 1\cdot 2^3 + 1\cdot 2^2 + 0\cdot 2^1 + 0\cdot 2^0$
$\quad 32 + 16 + 8 \;+\; 4 \;+\; 0 \;+\; 0 \;=\; \underline{\underline{60}}$

e) 0011010

$0\cdot 2^6 + 0\cdot 2^5 + 1\cdot 2^4 + 1\cdot 2^3 + 0\cdot 2^2 + 1\cdot 2^1 + 0\cdot 2^0$
$\quad 0 \;+\; 0 \;+\; 16 \;+\; 8 \;+\; 0 \;+\; 2 \;+\; 0 \;=\; \underline{\underline{26}}$

③ Convert the following binary numbers to hexadecimal:

a) $\underline{1100}\,\underline{1101}$
$\quad \scriptstyle 2^3 2^2 2^1 2^0 \; 2^3 2^2 2^1 2^0$

$8+4+0+0$	$8+4+0+1$	
12	13	$= (CD)_{16}$
C	D	

b) $\underline{1010}\,\underline{0101}$
$\quad \scriptstyle 2^3 2^2 2^1 2^0 \; 2^3 2^2 2^1 2^0$

$8+0+2+0$	$0+4+0+1$	
10	5	$= (A5)_{16}$
A	5	

c) $\underline{1111}\,\underline{0001}$
$\quad \scriptstyle 2^3 2^2 2^1 2^0 \; 2^3 2^2 2^1 2^0$

$8+4+2+1$	$0+0+0+1$	
15	1	$= (F1)_{16}$
F	1	

d) $\underline{1101}\underline{10}\,\underline{111}\underline{1100}$

$\underline{0001}$	$\underline{1011}$	$\underline{0111}$	$\underline{1100}$	
$\scriptstyle 2^3 2^2 2^1 2^0$	$\scriptstyle 2^3 2^2 2^1 2^0$	$\scriptstyle 2^3 2^2 2^1 2^0$	$\scriptstyle 2^3 2^2 2^1 2^0$	
$0+0+0+1$	$8+0+2+1$	$0+4+2+1$	$8+4+0+0$	
1	11	7	12	$= (1B7C)_{16}$
1	B	7	C	

Decimal		Hexa
0	→	0
1	→	1
2	→	2
3	→	3
4	→	4
5	→	5
6	→	6
7	→	7
8	→	8
9	→	9
10	→	A
11	→	B
12	→	C
13	→	D
14	→	E
15	→	F

④ Convert the following hexadecimal numbers to decimal:

a) $\overset{16^1}{1}\overset{16^0}{0}$

$1 \cdot 16^1 + 0 \cdot 16^0$

$16 + 0 = \underline{\underline{16}}$

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b) 4E3

$4 \cdot 16^2 + 14 \cdot 16^1 + 3 \cdot 16^0$

$1024 + 224 + 3 = \underline{\underline{1251}}$

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c) FF0

$15 \cdot 16^2 + 15 \cdot 16^1 + 0 \cdot 16^0$

$3840 + 240 + 0 = \underline{\underline{4080}}$

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d) 200

$2 \cdot 16^2 + 0 \cdot 16^1 + 0 \cdot 16^0$

$512 + 0 + 0 = \underline{\underline{512}}$

⑤ Encode the following words into bits using the ASCII encoding table in Figure 1.9.

<u>By using ASCII encoding table;</u>

a) LET

1001100   1000101   1010100

b) RESET!

1010010   1000101   1010011   1000101   1010100   0100001

c) HELLO $1

1001000 1000101 1001100 1001100 1001111 0100000 0100100 0110001