

Name Answers

CE-1901-11 - Dr. Durant - Quiz 1
Winter 2016-'17, Week 1

1. (1 point) An analog voltage signal is allowed to vary continuously within some range. An ideal digital voltage signal takes on a finite number of levels; when there are only 2 levels, we have a base-2 or binary system. What is a key **advantage** of a digital/binary system over an analog one?

knowing the actual, intended value is at a discrete level,
we choose the nearest value attaining some immunity
to noise in the signal

2. (2 points) **Write** all the 4-bit unsigned numbers in both binary and decimal.

0000	0	1000	8
0001	1	1001	9
0010	2	1010	10
0011	3	1011	11
0100	4	1100	12
0101	5	1101	13
0110	6	1110	14
0111	7	1111	15

3. (2 points) **List/calculate** the powers of 2 from 2^0 to 2^9 as decimal numbers.

i	2^i
0	1
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512

4. (2 points) **Convert** 101001 from binary to decimal. **Show** your work.

$$\begin{array}{r}
 32 \\
 8 \\
 + 1 \\
 \hline
 41
 \end{array}$$

5. (2 points) **Convert** 90 from decimal to binary. **Show** your work.

$$\begin{array}{r}
 2 \overline{)90} \\
 2 \overline{)45} R0 \\
 2 \overline{)22} R1 \\
 2 \overline{)11} R0 \\
 2 \overline{)5} R1 \\
 2 \overline{)2} R1 \\
 2 \overline{)1} R0 \\
 0 R1
 \end{array}$$

LSB = $2^0 = 1$'s place

MSB = $2^6 = 64$'s place

MSB → 1011010 ← LSB

check:

$$\begin{array}{r}
 2 \\
 \rightarrow 64 \\
 16 \\
 8 \\
 + 2 \\
 \hline
 90 \checkmark
 \end{array}$$

6. (1 point) **What** is the largest unsigned number that can be represented with 8 bits?

- a. Write the answer as a **binary** (base 2) number:

$$11111111$$

- b. Write the answer as a **decimal** (base 10) number:

add up $1+2+4+\dots+128 = \boxed{255}$ or, take the shortcut:

1 less than $1-0000-0000$

$$2^8 - 1 = 256 - 1 = \boxed{255}$$