EEN6 284 | Lecture 01 | JAN 13 2021

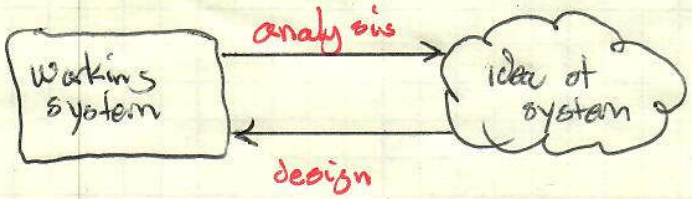
Welcome Theory & Practice of Digital Design

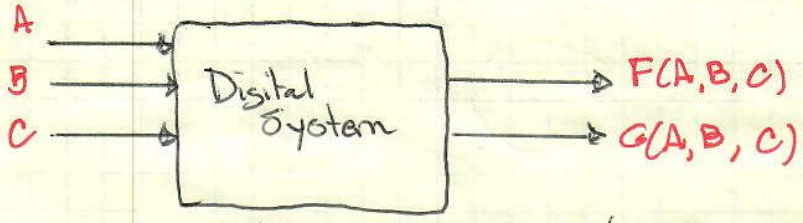
Few Details before we start

Lecture	Lab
Live or Zoom	Live
Canvas syllabus text book	Next Tuesday No pre lab Install Quartus software

- TA office hours
- I have office hours
- Your success is my goal

Title: Analysis & Design of Digital Systems





inputs & outputs are bits (0 or 1)

A, B, C are Boolean variables meaning they equal 0 or 1

F(A,B,C) & G(A,B,C) are equal to 0 or 1, depend on A, B, C

Arrangements of bits can represent many different things
- letters
- dog food codes
- Quantity (numbers)

} Bits have no meaning only interpretation

We will focus on interpreting collections of bits as numbers using positional numbering = the left/right position of a symbol in a number determines its weight.

Ex: Decimal = Base 10 = 10 symbols = {0, 1, 2, ..., 9}

$365_{10} = 3*10^2 + 6*10^1 + 5*10^0$

2 1 0

$= 300 + 60 + 5$

Ex: Binary = Base 2 = 2 symbols = {0, 1}

101_2 (2 1 0) $= 1*2^2 + 0*2^1 + 1*2^0$

$= 4 + 0 + 1 = 5$

We just converted binary to decimal.

Try: 1011_2 (3 2 1 0)

Convert Decimal to binary

- Represent the decimal value x as the sum of distinct powers of 2.

Power of 2 table

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

Try: $11_{10} = 8*2 + 1$ <find largest 2^i leq value>

$11 - 8 = 3$, $3 - 2 = 1$

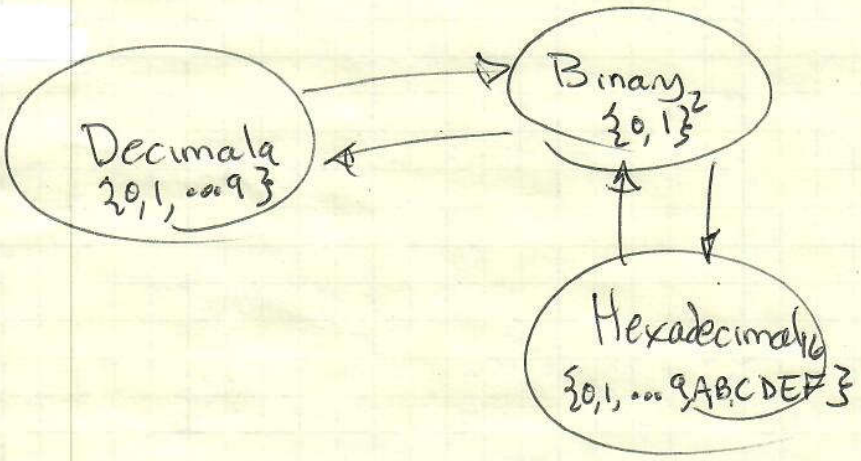
$= 1*2^3 + 0*2^2 + 1*2^1 + 1*2^0 = 1011_2$

Try: $123_{10} = 1111011_2$

Most significant Bit (MSB)

Least Significant Bit (LSB)

Number Conversions



Convert Hexadecimal to binary

- Convert each hex digit into its 4-bit binary code
-

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

$$3EA_{16} = 0011\ 1110\ 1010_2$$