CS 101
Introduction to Computing

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(Theory: Pre-midsem)

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Friday, February 28, 2020

The Decimal System

- The number $(256)_{10}$ means

  2 1 0

- $(256)_{10} = 2x10^2 + 5x10^1 + 6x10^0$

- Similarly

2 1 0 -1 -2

$789.51 = 7x10^2 + 8x10^1 + 9x10^0 + 5x10^{-1} + 1x10^{-2}$

Binary

- The Binary system comprises only two numbers – 0 and 1.
- Numbers could be – 00, 01, 10, 11 (meaning 0,1,2,3 in decimal)
- Thus,

$$(0101)_2 = 0x2^3 + 1x2^2 + 0x2^1 + 1x2^0$$

Similarly,

$$(110.01)_2 = 1x2^2 + 1x2^1 + 0x2^0 + 0x2^{-1} + 1x2^{-2}$$

The Bit

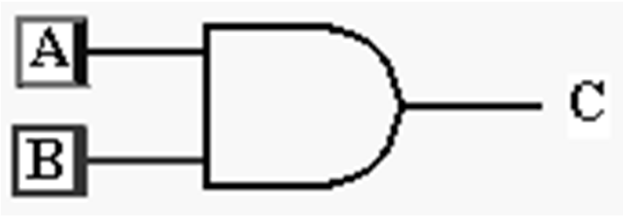
- **Bit**: Binary Digit
- 4 bits make a Nibble and 8 bits make a Byte
- Using 2 bits we can generate 4 combinations viz. 00, 01, 10, 11 standing for 0, 1, 2 and 3 in the decimal system
- Thus, using n bits we can generate 2^n combinations

LOGIC GATES

- A **logic gate** is an electronic component whose output is computed based on a function of the inputs.
- A gate can have one or more inputs.
- Inputs may be given directly as ***0*** (LOW VOLTAGE*) or ***1*** (HIGH VOLTAGE*) or they could be derived from the output of other logic gates.
- * LOW generally means 0V and HIGH generally means 3V or 5V.
- Computers use a very large number of such interconnected gates.

LOGIC GATES: *AND*

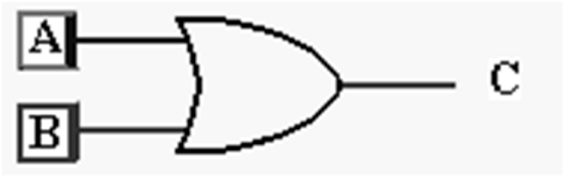
- In order for current to flow, both switches must be closed
  - Logic notation A•B = C



A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

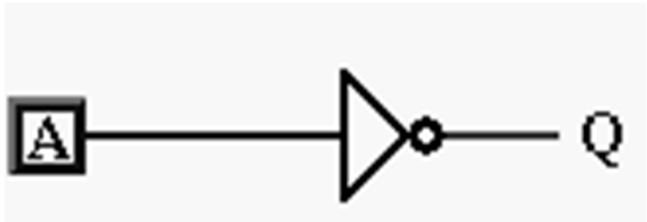
LOGIC GATES: *OR*

- Current flows if either switch is closed
  - Logic notation A + B = C



A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

GATES: Inversion (NOT)



Logic: Q = A’

A	Q
0	1
1	0

Q is said to be the complement of A and is denoted as either $\overline{A}$ or A’

GATES: Exclusive OR (XOR)

A	B	S
0	0	0
1	0	1
0	1	1
1	1	0