Digital Electronics 1

Part 7a of
"Electronics and Telecommunications"
A Fairfield University E-Course
Powered by LearnLinc

Module: Digital Electronics
(in two parts)

- Text: "Digital Logic Tutorial ," Ken Bigelow, http://www.play-hookey.com/digital/
- References:
  - "Electronics Tutorial", part 10 (Thanks to Alex Pounds) http://doctord.dyndns.org:8000/courses/Topics/Electronics/Alex_Pounds/Index.htm
- Contents:
  - 7 – Digital Electronics 1
    - 5 on-line sessions plus one lab and a quiz
  - 8 – Digital Electronics 2
    - 5 on-line sessions plus one lab and a quiz
- Mastery Test part 4 follows this Module

Section 7: Digital Electronics 1

- Logic gates and Boolean algebra
- Truth Tables
- Binary numbers
- Memory
- Flip-Flops

Section 8: Digital Electronics 2

- Clocks and Counters
- Shift Registers
- Decoders
- Multiplexers & Demultiplexers
- Sampling

- **MT4**

Section 7 Schedule

Session 7a	**03/05**	**Introduction: Binary, Logic Gates and Boolean**	**Alex Pounds: Part 10 "Ken B": Home, Basic Gates, & Boolean Algebra**
Session 7b	03/10	Logic Gates and Truth Tables	Alex Pounds: Part 10 "Ken B": Derived Gates, Xor
Session 7c	03/12	Binary numbers	"Keb B": Binary Addition
Session 7d	03/17	Memory: Registers, RAM & ROM	"Ken B": RS Nand Latch, Clocked RS Latch, D Latch
Session 7e (Lab - 03/22, Sat.)	03/19	Pulses, Clocks and Flip-Flops	"Ken B": RS Flip-Flop, JK Flip-Flop, D Flip-Flop, Flip-Flop Symbols
Session 7f (Quiz 7 due 03/30)	03/24	Review for Quiz 7	
Session 7g	03/31	Quiz Results	

Introduction to Logic

- In this Digital world a value is either:
  - 1, “True”, “On”, “High” (5 volts in electronics)
  - 0, “False”, “Off”, “Low” (0 volts in electronics)
- The equivalentMathematics is Boolean Algebra George Boole (1854)
- A “Variable” (A, B, X, …) is either true or false
- An “Expression” (X = A + B) is evaluated using the rules of Boolean Algebra
  (see Boolean at play-hookey.com)

Logic Continued

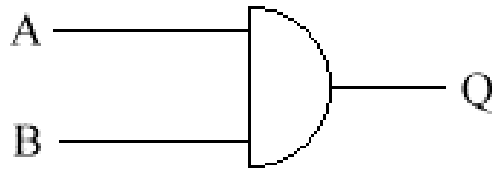
- We represent a logical operation using “Gate” symbols
- Each “Gate” corresponds to an electrical circuit that performs the Boolean equivalent operation on it’s input values.

Truth Tables

- A “Truth Table” enumerates all of the possible input conditions to a Gate and shows the resulting output values.

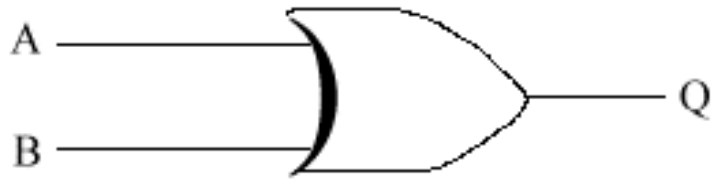
Basic Logic Gates

- AND
  - Q is True when both A AND B are True
  - Q = A*B



A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

- OR
  - Q is True when either A or B is True
  - Q = A+B



A	B	Q
0	0	0
0	1	1
1	0	1
1	1	1

- NOT
  - Q is true when A is false and false when A is true
  - Q = A (or A′)

A	Q
0	1
1	0

Simulation

- We'll go to www.play-hookey.com/digital to see these gates in action

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