Section 2-3 and 2-4 Boolean Expressions and Truth Tables, Basic Theorems

Friday, January 22, 2021 9:21 AM

We can combine expressions, e.g. $AB+C$

$(A \cdot B + C)$ or $[(AB)' + D]E$ etc.

Order of operations:

If no parentheses, order is

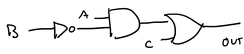
1. NOT
2. AND
3. OR

Example

$AB' + C$

do B' first, then AB', then add C

In logic gates would look like



Example $(AB+C)' + D'E$

We can evaluate this function for a particular set of A, B, C, D, E

e.g. suppose $A=1$ $B=1$ $C=0$ $D=0$ $E=1$

$(AB+C)' + D'E = ?$

$(1 \cdot 1 + 0)' + 0' \cdot 1$

$(1+0)' + 1 \cdot 1$

$(1)' + 1 =$

$0 + 1 =$

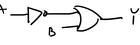
"Literal": a value like a, a', b, b' etc

eg.

$ab' + cba' + c'd + a'b$ has 7 literals

a, a', b, b', c, c', d

Truth table gives the results of a Boolean expression for every possible combination of inputs:

Example $Y = A' + B$ 

We have 2 inputs, (A, B)

So then are four combinations

A	B	A'	A'+B

Example $(A + B'C)'$ 3 variables so 8 combs. (2^3)

A	B	C					

2.4 Basic Theorems

Operations with 1 or 0

$X + 0 =$ $X \cdot 1 =$

$X + 1 =$ $X \cdot 0 =$

Idempotent Laws (Idem: "same" potent: "strength")

$X + X =$ $X \cdot X =$

Involution

$(X')' = X$

Complementarity

$X + X' = 1$ $X \cdot X' = 0$

We can use these laws to simplify expressions (Why simplify?) ($)

Example $AB' + C + 1$

$C+1=1$ ops with 0, 1

$AB' + 1$

$= 1$ ops with 0 or 1 (let $X = AB'$, then $X+1=1$)

Example

$(AB' + C)(AB' + C)'$

let $X = AB' + C$

$X \cdot X' = 0$ complementarity