Topic 5: Boolean Algebra

Ch12.1 Boolean Functions

Identities of Boolean Algebra

See Appendix E-1 for Boolean Identities table.

- The **dual** of a Boolean expression is obtained by interchanging $+$ and $\cdot$ and interchanging 0s and 1s.

Huntington's postulates

- **Axioms:** *Closure, Identity, Commutativity, Distributivity, Complement*, and *Distinct Elements*.

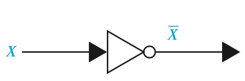
Ch12.2 Representing Boolean Functions

Sum-of-Products or **Disjunctive normal form:** i.e. $xy + yx + xz$

Product-of-sums expansion or **Conjunctive normal form:** i.e. $(x + y)(x + z)(y + z)$

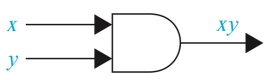
- Can be found from sum-of-product expansions by taking duals.

Ch12.3 Logic Gates

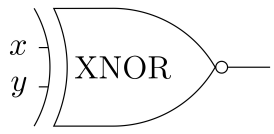


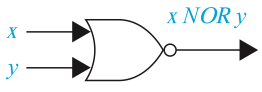
Inverter

OR gate

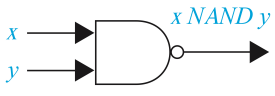


AND gate

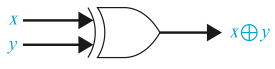




NOR gate



NAND gate



XOR gate

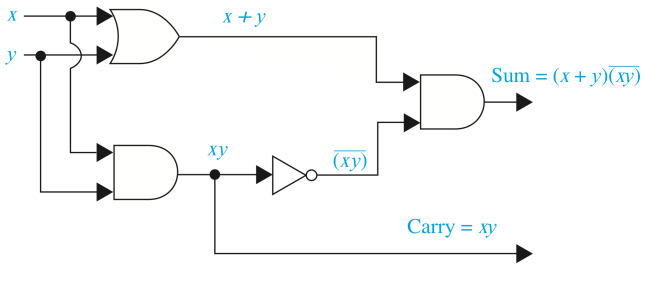
Commutative & associative: AND, OR, XOR, XNOR.

Commutative & !associative: NAND, NOR.

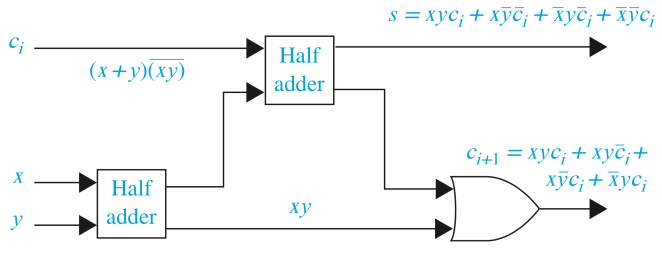
Adders

Input		*Output*	
x	***y***	***s***	***c***
1	1	0	1
1	0	1	0
0	1	1	0
0	0	0	0

Input and Output for the Half Adder



Half Adder

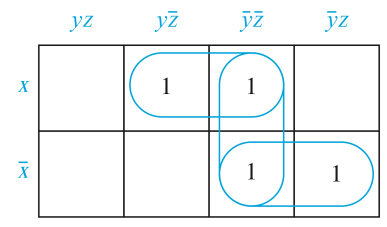


Full Adder

Ch12.4 Minimization of Circuits

Karnaugh Maps (K-maps)

- 1 is placed in the cell representing a minterm
- Cells are said to be **adjacent** if the minterms that they represent differ in exactly one literal



$x.\overline{z} + \overline{y}.\overline{z} + \overline{x}.\overline{y}$