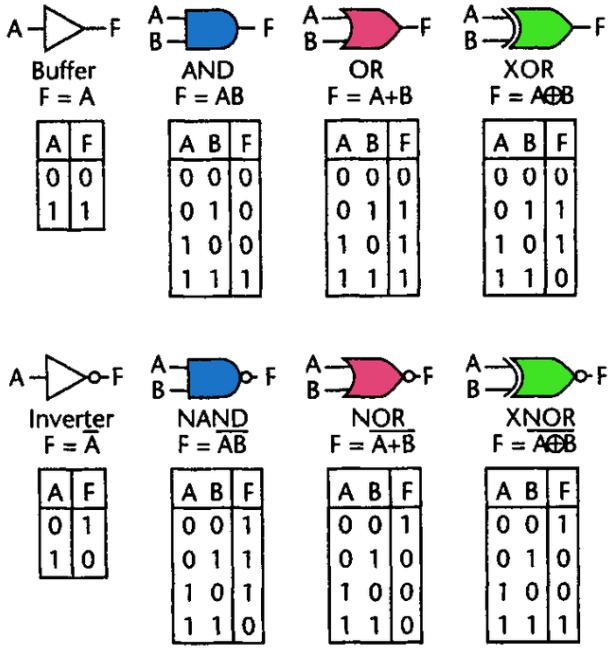
EE2000 Logic Circuit Design

Lecture 1 – Logic Function and Boolean Algebra



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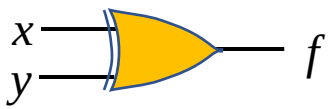
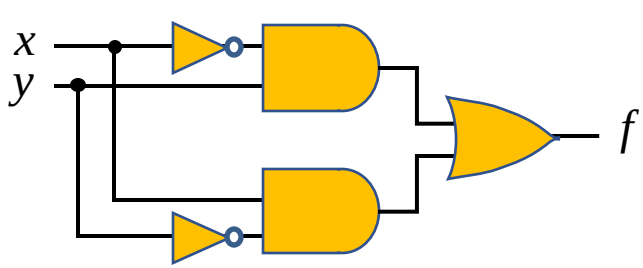
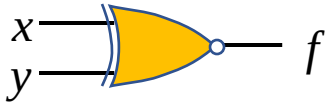
Exercises



x	y	f
0	0	0
0	1	1
1	0	1
1	1	0

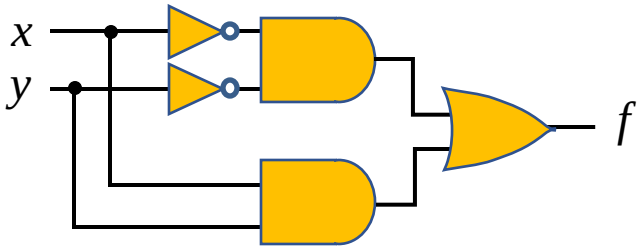
$$f = x'y + xy'$$





x	y	f
0	0	1
0	1	0
1	0	0
1	1	1

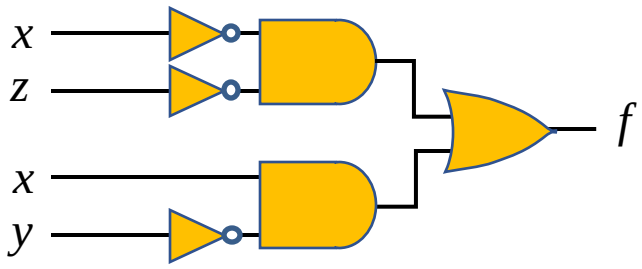
$$f = x'y' + xy$$



Exercises

Given the Boolean function $f(x, y, z) = xy' + x'z'$, draw the Logic Circuit and work out the truth table.

Inputs			xy'	$x'z'$	*Output*
x	y	z			$f(x, y, z)$
0	0	0	0	1	1
0	0	1	0	0	0
0	1	0	0	1	1
0	1	1	0	0	0
1	0	0	1	0	1
1	0	1	1	0	1
1	1	0	0	0	0
1	1	1	0	0	0



Question

- Which of the following has the same function as $x + x'y$?
  - a) $x + xy'$
  - b) $x + y$
  - c) $x' + y$
  - d) y

$$x + x'y = (x + x')(x + y) \quad \text{distributive}$$
$$= 1 \cdot (x + y) \quad \text{complement}$$
$$= x + y \quad \text{identity}$$

Exercise

- Simplify the following expression.

$$xyz' + xyz + xy'z + x'yz + x'y'z + x'y'z'$$

$$= xy + xy'z + x'yz + x'y' \quad \text{adjacency}$$

$$= x(y + y'z) + x'(y' + yz) \quad \text{simplification}$$

$$= x(y + z) + x'(y' + z)$$

$$= xy + x'y' + z(x + x') \quad \text{complement}$$

$$= xy + x'y' + z$$

5 literals; 3 terms

Exercise

- Simplify the following expression.

$$(x + y + z)(x + y + z')(x + y' + z)(x + y' + z') \quad \text{adjacency}$$

$$= (x + y)(x + y')$$

$$= x$$

1 literal; 1 term

Question

Which of the following can be simplified using consensus theorem?

a) $xy'z + wx' + wy'z' + wy$

b) $wxy' + xyz' + w'xz' + yz$

c) $wx' + xy'z + w'yz' + x'yz'$