Funciones booleanas

Las ***funciones booleanas*** están constituidas de variables booleanas que pueden tomar los valores de cero lógico ó uno lógico.

Operadores booleanos básicos:

1. NOT — F(A) = ***NOT*** A = $\overline{A}$
2. AND • F(A,B) = A ***AND*** B = A • B
3. OR + F(A,B) = A ***OR*** B = A + B

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Funciones booleanas

NOT

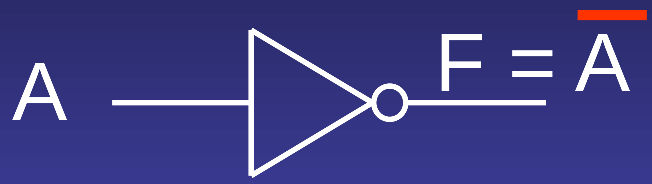


Tabla de verdad

A	$F = \overline{A}$
0	1
1	0

AND

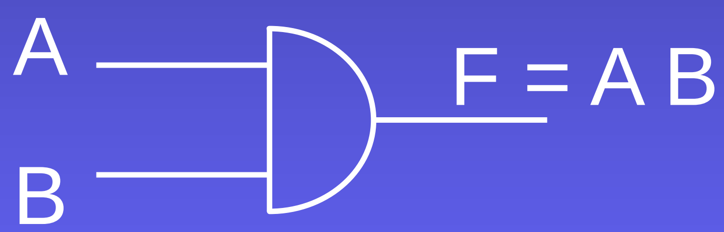
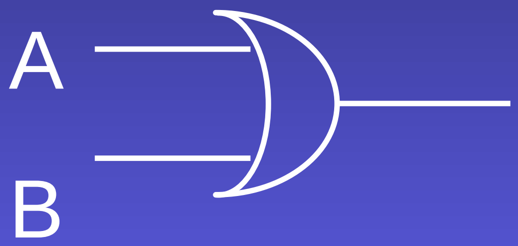


Tabla de verdad

A	B	F = A B
0	0	0
0	1	0
1	0	0
1	1	1

Funciones booleanas

OR



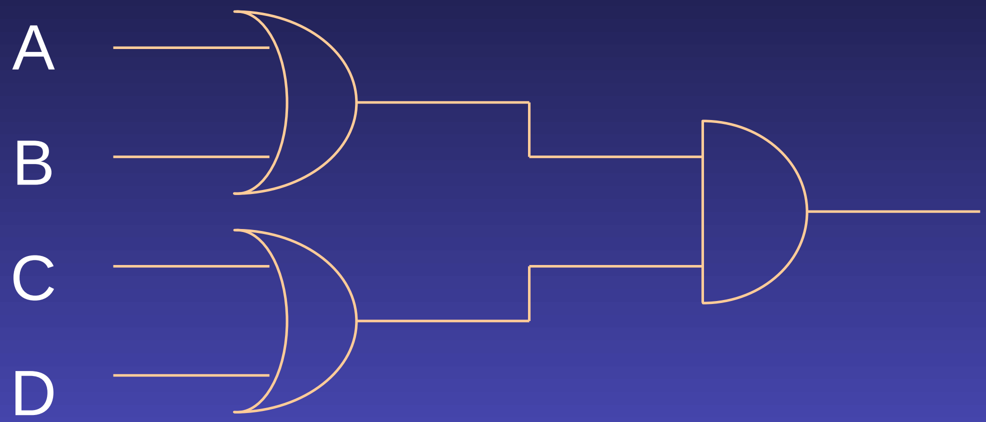
F = A + B

Símbolo

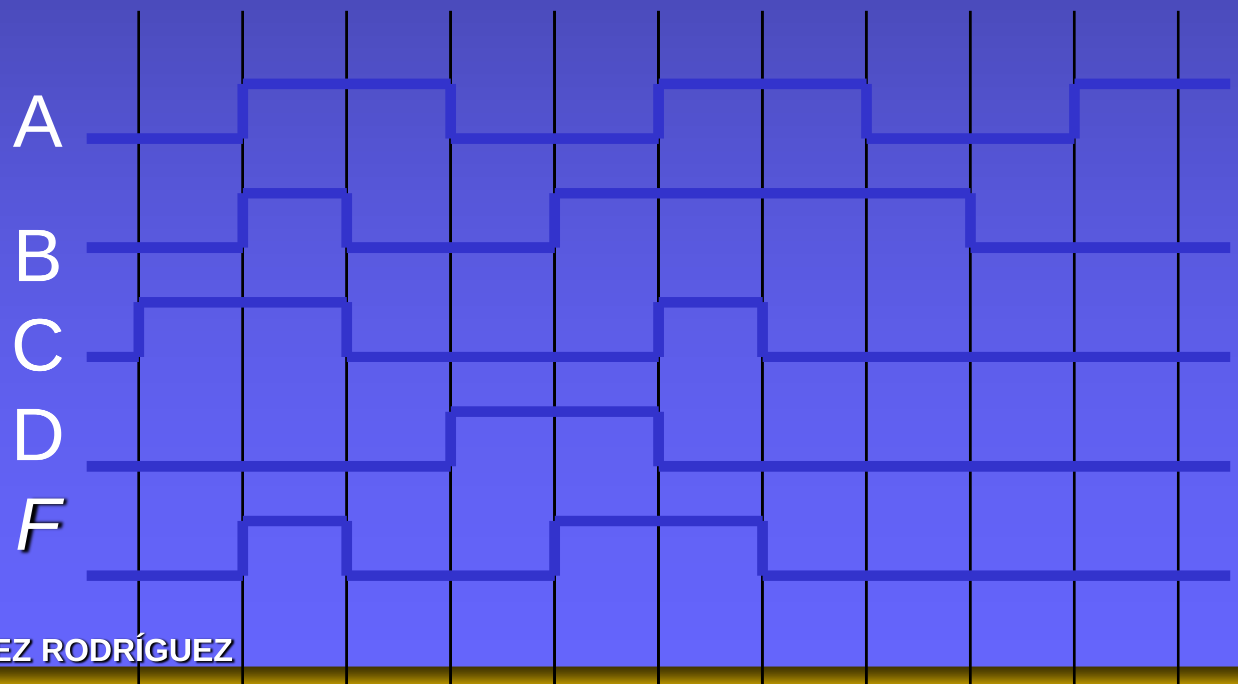
Tabla de verdad

A	B	F = A + B
0	0	0
0	1	1
1	0	1
1	1	1

Funciones booleanas



F = (A+B)(C+D)



Teoremas del Algebra Booleana.

1.- $x \circ 1 = x$ $\qquad x+0 = x$

2.- $x \circ x = x$ $\qquad x + x = x$

3.- $x \circ 0 = 0$ $\qquad x + 1 = 1$

4.- $x \circ \overline{x} = 0$ $\qquad x + \overline{x} = 1$

5.- $\overline{\overline{x}} = x$

6.- $\overline{(x \circ y)} = \overline{x}+\overline{y}$ $\qquad \overline{x+y} = \overline{x} \circ \overline{y}$

Teoremas del Algebra Booleana.

7.- $XY = YX$ $X+Y = Y+X$

8.- $XYZ = X(YZ) = (XY)Z$ $X+Y+Z = X+(Y+Z)$

9.- $X(Y+Z) = XY + XZ$ $X+(YZ) = (X+Y)(X+Z)$

10.- $X(X+Y) = X$ $X+(XY) = X$

11.- $(X+Y)(X+Y') = X$ $XY+XY' = X$

12.- $X(X'+Y) = XY$ $X+X'Y = X+Y$

13.- $XY+X'Z+YZ = XY+X'Z$ $(X+Y)(x'+Z)(Y+Z) = (X+Y)(X'+Z)$

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TAREA

Simplificar utilizando el álgebra de Boole

$$\bar{a}\cdot b\cdot c+a\cdot \bar{b}\cdot c+a\cdot \bar{b}\cdot \bar{c}+a\cdot b\cdot c$$

$$(\bar{a}\cdot b)\cdot(\bar{a}+b)+a\cdot b\cdot \bar{c}+a\cdot b$$

$$\bar{a}\cdot b\cdot \bar{c}\cdot d+\bar{a}\cdot b\cdot \bar{c}\cdot \bar{d}+\bar{a}\cdot b\cdot c\cdot d+\bar{a}\cdot \bar{b}\cdot c\cdot d$$

$$a+\bar{a}\cdot b$$

$$a\cdot(a\cdot b+a\cdot \bar{b}+a\cdot b\cdot c+a\cdot b\cdot \bar{c}+\bar{a})$$

$$\bar{a}\cdot \bar{b}\cdot c+\bar{a}\cdot b\cdot \bar{c}+\bar{a}\cdot b\cdot c+a\cdot b\cdot \bar{c}+a\cdot b\cdot c$$

$$\bar{a}\cdot \bar{b}\cdot \bar{c}\cdot \bar{d}+\bar{a}\cdot \bar{b}\cdot \bar{c}\cdot \bar{d}+\bar{a}\cdot b\cdot \bar{c}\cdot \bar{d}+\bar{a}\cdot b\cdot \bar{c}\cdot d+\bar{a}\cdot b\cdot c\cdot \bar{d}+\bar{a}\cdot b\cdot c\cdot d$$

$$a\cdot b\cdot c\cdot d+a\cdot b\cdot c\cdot \bar{d}+a\cdot b\cdot \bar{c}\cdot d+a\cdot b\cdot \overline{c\cdot d}$$

$$\bar{a}\cdot \bar{b}\cdot c+\bar{a}\cdot b\cdot \bar{c}+\bar{a}\cdot b\cdot c+a\cdot \bar{b}\cdot c$$

$$\overline{(\bar{a}+b)\cdot(\bar{c}+a)}$$