Logic Gates

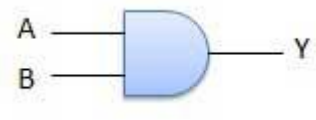
Logic gates are the basic building blocks of any digital system. It is an electronic circuit having one or more than one input and only one output. The relationship between the input and the output is based on certain **logic**. Based on this, logic gates are named as AND gate, OR gate, NOT gate etc.

AND Gate

A circuit which performs an AND operation is shown in figure. It has n input (n >= 2) and one output.

Y = A AND B AND C ..... N
Y = A.B.C ..... N
Y = ABC ..... N

Logic diagram



Truth Table

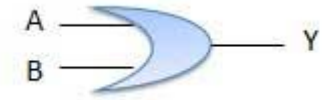
Inputs		Output
A	B	AB
0	0	0
0	1	0
1	0	0
1	1	1

OR Gate

A circuit which performs an OR operation is shown in figure. It has n input (n >= 2) and one output.

Y = A OR B OR C ..... N
Y = A + B + C ..... N

Logic diagram



Truth Table

Inputs		Output
A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	1

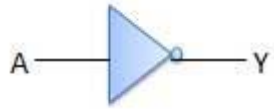
NOT Gate

NOT gate is also known as **Inverter**. It has one input A and one output Y.

Y = NOT A

$Y = \overline{A}$

Logic diagram



Truth Table

Inputs	Output
A	B
0	1
1	0

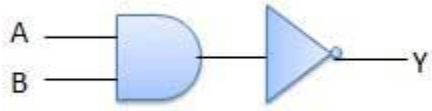
NAND Gate

A NOT-AND operation is known as NAND operation. It has n input (n >= 2) and one output.

Y = A NOT AND B NOT AND C ..... N

Y = A NAND B NAND C ..... N

Logic diagram



Truth Table

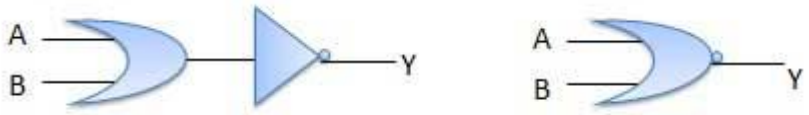
Inputs		Output
A	B	$\overline{AB}$
0	0	1
0	1	1
1	0	1
1	1	0

NOR Gate

A NOT-OR operation is known as NOR operation. It has n input (n >= 2) and one output.

Y = A NOT OR B NOT OR C ..... N
Y = A NOR B NOR C ..... N

Logic diagram



Truth Table

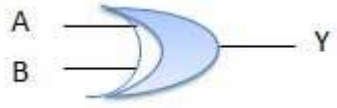
Inputs		Output
A	B	$\overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0

XOR Gate

XOR or Ex-OR gate is a special type of gate. It can be used in the half adder, full adder and subtractor. The exclusive-OR gate is abbreviated as EX-OR gate or sometime as X-OR gate. It has n input (n >= 2) and one output.

Y = A XOR B XOR C ..... N
Y = $A \oplus B \oplus C$ ..... N
Y = $\overline{A}B + A\overline{B}$

Logic diagram



Truth Table

Inputs		Output
A	B	A ⊕ B
0	0	0
0	1	1
1	0	1
1	1	0

XNOR Gate

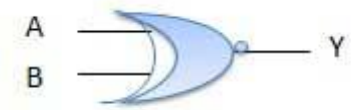
XNOR gate is a special type of gate. It can be used in the half adder, full adder and subtractor. The exclusive-NOR gate is abbreviated as EX-NOR gate or sometime as X-NOR gate. It has n input (n >= 2) and one output.

$$Y = A \text{ XOR } B \text{ XOR } C \ldots\ldots N$$

$$Y = A \odot B \odot C \ldots\ldots N$$

$$Y = \overline{A}B + A\overline{B}$$

Logic diagram



Truth Table

Inputs		Output
A	B	A ⊙ B
0	0	1
0	1	0
1	0	0
1	1	1

References:

https://www.tutorialspoint.com