Sr. No: 11

Name: Soham Desai

Date: 18/01/22

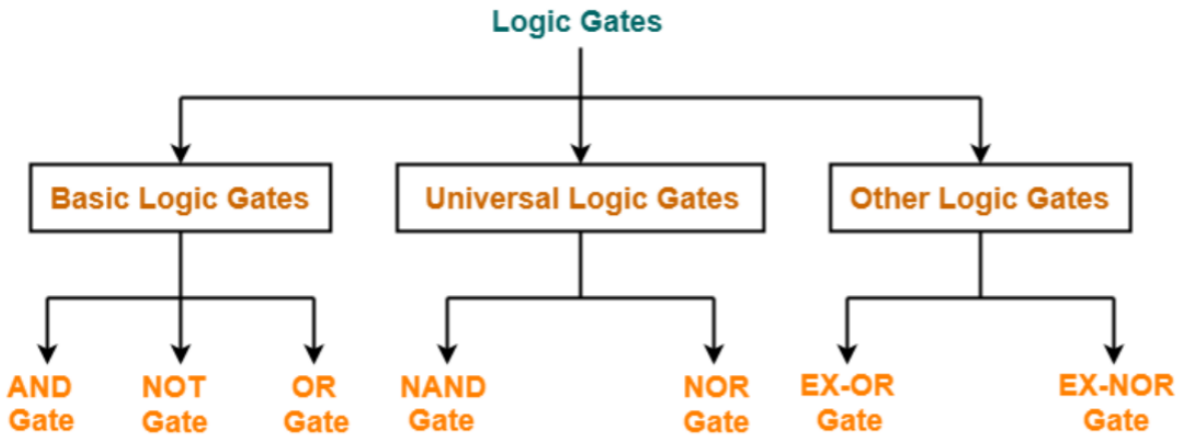
Experiment 2

Aim: Verify the truth table of various logic gates (basic and universal gates)

LO & Statement : LO: 2) Analyze and design combinational circuits

Software Requirements: Logisim software

Theory:

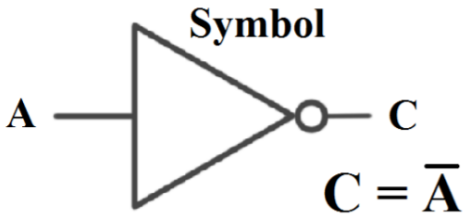


Types of Logic Gates

1)NOT GATE -

The NOT gate is a single input single output gate. This gate is also known as Inverter because it performs the inversion of the applied binary signal, i.e., it converts 0 into 1 or 1 into 0. The gate which has a high input signal only when their input signal is low such type of gate is known as the not gate.

Fig 1



Truth Table

INPUT	OUTPUT
A	NOT A
0	1
1	0

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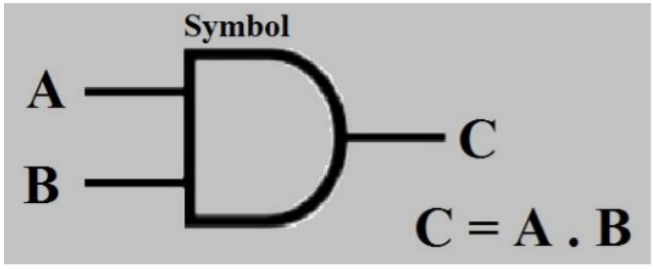
2) AND GATE -

The AND gate plays an important role in the digital logic circuit. The output state of the AND gate will always be low when any of the inputs states is low. Simply, if any input value in the AND gate is set to 0, then it will always return low output(0). The logic or Boolean expression for the AND gate is the logical multiplication of inputs denoted by a full stop or a single dot



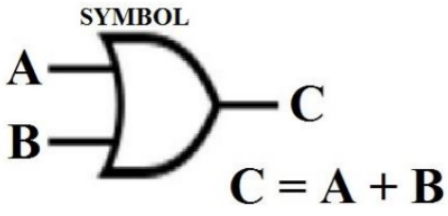
Truth Table

INPUT		OUTPUT
A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

Fig 2

3) OR GATE -

The OR gate is a mostly used digital logic circuit. The output state of the OR gate will always be low when both of the inputs states is low. Simply, if any input value in the OR gate is set to 1, then it will always return high-level output(1). The logic or Boolean expression for the OR gate is the logical addition of inputs denoted by plus sign(+)



TRUTH TABLE

INPUT		OUTPUT
A	B	A OR B
0	0	0
0	1	1
1	0	1
1	1	1

Fig 3

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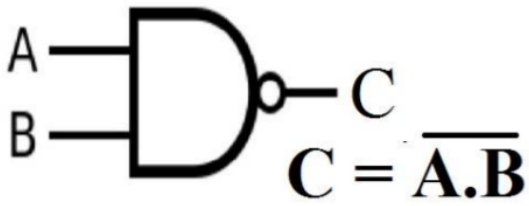
4) NAND GATE -

The NAND gate is a special type of logic gate in the digital logic circuit. The NAND gate is the universal gate. It means all the basic gates such as AND, OR, and NOT gate can be constructed using a NAND gate. The NAND gate is the combination of the NOT-AND gate. The output state of the NAND gate will be low only when all the inputs are high. Simply, this gate returns the complement result of the AND gate.



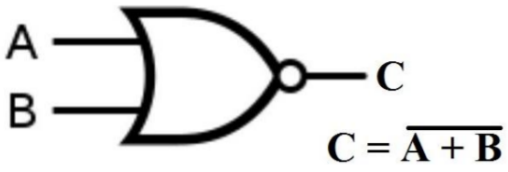
Truth Table

INPUT		OUTPUT
A	B	A NAND B
0	0	1
0	1	1
1	0	1
1	1	0

Fig 4

5) NOR GATE -

The NOR gate is also a universal gate. So, we can also form all the basic gates using the NOR gate. The NOR gate is the combination of the NOT-OR gate. The output state of the NOR gate will be high only when all of the inputs are low. Simply, this gate returns the complement result of the OR gate.



INPUT		OUTPUT
A	B	A NOR B
0	0	1
0	1	0
1	0	0
1	1	0

Fig 5

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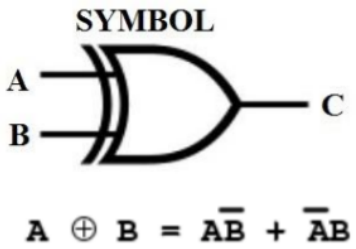
6) XOR GATE -

The XOR gate stands for the Exclusive-OR gate. This gate is a special type of gate used in different types of computational circuits. Apart from the AND, OR, NOT, NAND, and NOR gate, there are two special gates, i.e., Ex-OR and Ex-NOR. These gates are not basic gates in their own and are constructed by combining with other logic gates. Their Boolean output function is significant enough to be considered as a complete logic gate. The XOR and XNOR gates are the hybrids gates. The 2-input OR gate is also known as the Inclusive-OR gate because when both inputs A and B are set to 1, the output comes out 1(high). In the Ex-OR function, the logic output "1" is obtained only when either A="1" or B="1" but not both together at the same time. Simply, the output of the XOR gate is high(1) only when both the inputs are different from each other.



INPUT		OUTPUT
A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

Fig 6

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7) XNOR GATE -

The XNOR gate is the complement of the XOR gate. It is a hybrid gate. Simply, it is the combination of the XOR gate and NOT gate. The output level of the XNOR gate is high only when both of its inputs are the same, either 0 or 1. The symbol of the XNOR gate is the same as XOR, only complement sign is added. The XNOR gate is also called the Equivalence gate.

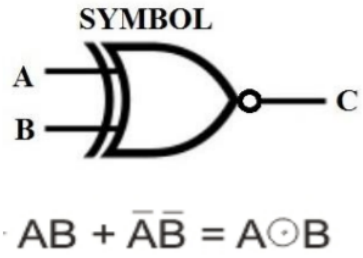
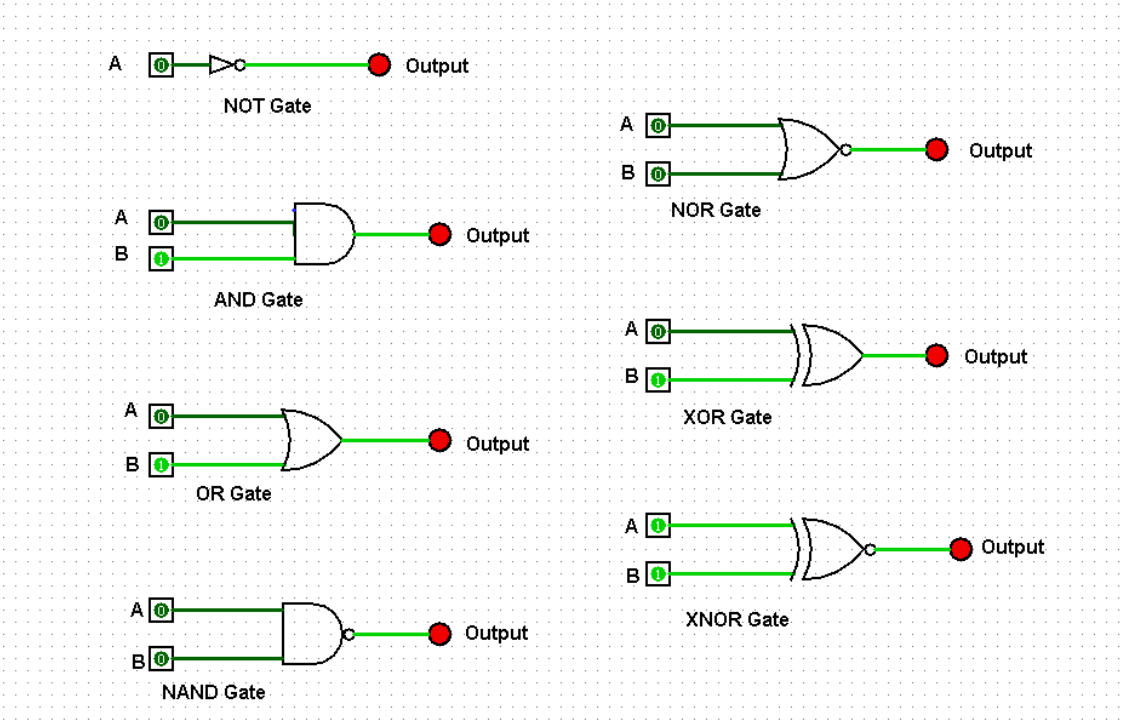


Fig 7

Input		Outpu
A	B	A XNOR
0	0	1
0	1	0
1	0	0
1	1	1

Output :



Conclusion : All the logic gates are created successfully and are running as desired.