Experiment 1

Aim - Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, XOR, XNOR gates.

Tools Used –

Circuit verse: CircuitVerse is a free, open-source platform which allows users to construct digital logic circuits online.

Theory –

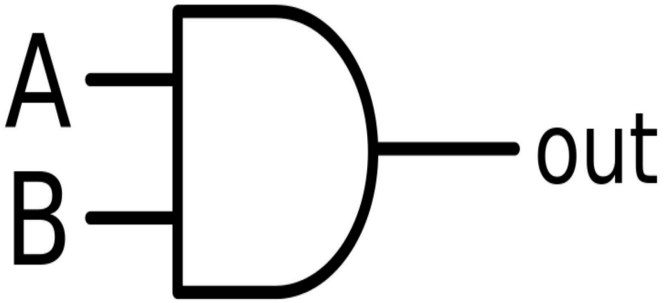
Logic gates are the basic building blocks of any digital system. Logic gates are electronic circuits having one or more than one input and only one output. The relationship between the input and the output is based on a certain logic. Based on this, logic gates are named as:

1. AND gate
2. OR gate
3. NOT gate
4. NAND gate
5. NOR gate
6. Ex-OR gate
7. Ex-NOR gate

1) AND gate

The AND gate is an electronic circuit that gives a high output (1) only if all its inputs are high. A dot (.) is used to show the AND operation i.e. A.B or can be written as AB

Y= A.B



Logic Symbol of AND Gate

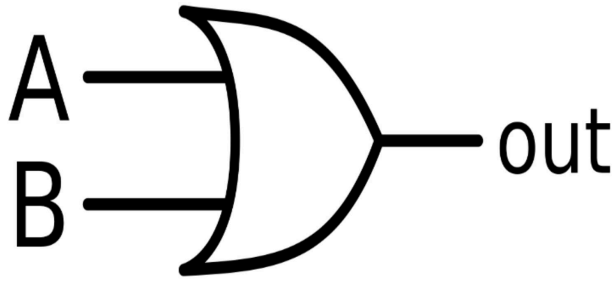
Input		Output
A	B	Y=A.B
0	0	0
0	1	0
1	0	0
1	1	1

Truth Table of AND Gate

2) OR gate

The OR gate is an electronic circuit that gives a high output (1) if one or more of its inputs are high. A plus (+) is used to show the OR operation.

Y= A+B



Logic Symbol of OR Gate

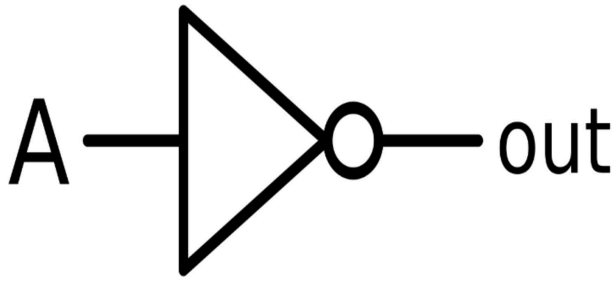
Input		Output
A	B	Y=A+B
0	0	0
0	1	1
1	0	1
1	1	1

Truth Table of OR Gate

3) NOT gate

The NOT gate is an electronic circuit that produces an inverted version of the input at its output. It is also known as an inverter. If the input variable is A, the inverted output is known as NOT A. This is also shown as A' or A with a bar over the top, as shown at the outputs.

Y= A'



Logic Symbol of NOT Gate

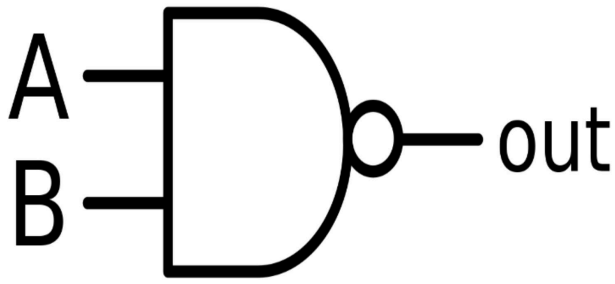
Input	Output
A	Y
0	1
1	0

Truth Table of NOT Gate

4) NAND gate

This is a NOT-AND gate which is equal to an AND gate followed by a NOT gate. The outputs of all NAND gates are high if any of the inputs are low. The symbol is an AND gate with a small circle on the output. The small circle represents inversion.

Y= (A.B)'



Logic Symbol of NAND Gate

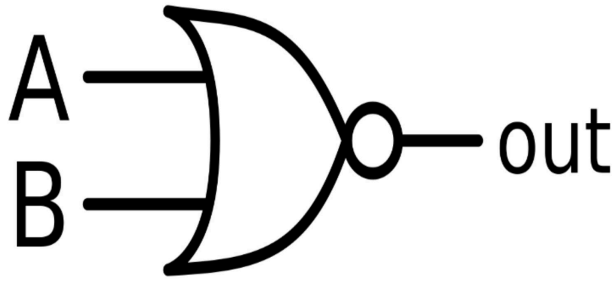
Input	Input	Output
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

Truth Table of NAND Gate

5) NOR gate

This is a NOT-OR gate which is equal to an OR gate followed by a NOT gate. The outputs of all NOR gates are low if any of the inputs are high. The symbol is an OR gate with a small circle on the output. The small circle represents inversion.

Y= (A+B)'



Logic Symbol of NOR gate

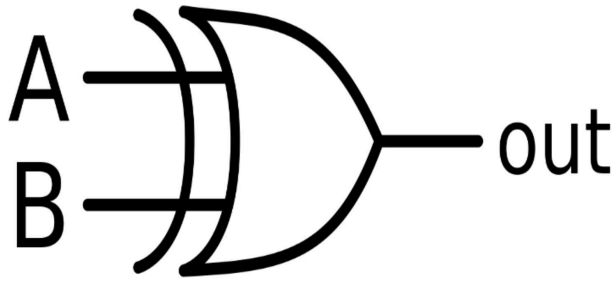
A	B	F
0	0	1
0	1	0
1	0	0
1	1	0

Truth Table of NOR gate

6) X-OR gate

The 'Exclusive-OR' gate is a circuit which will give a high output if either, but not both of its two inputs are high. An encircled plus sign (⊕) is used to show the X-OR operation.

Y= A⊕B



Logic Symbol of X-OR gate

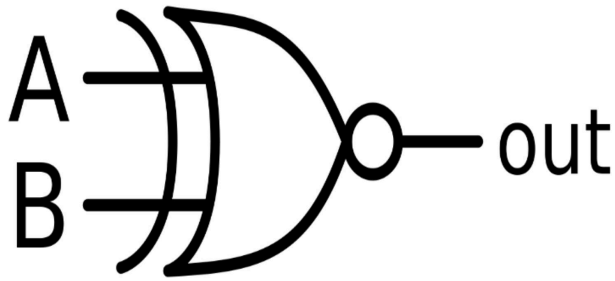
A	B	A **XOR** B
0	0	0
0	1	1
1	0	1
1	1	0

Truth Table of X-OR gate

7) X-NOR gate

The 'Exclusive-NOR' gate circuit does the opposite to the X-OR gate. It will give a low output if either, but not both of its two inputs are high. The symbol is an X-OR gate with a small circle on the output. The small circle represents inversion.

Y= (A⊕B)'



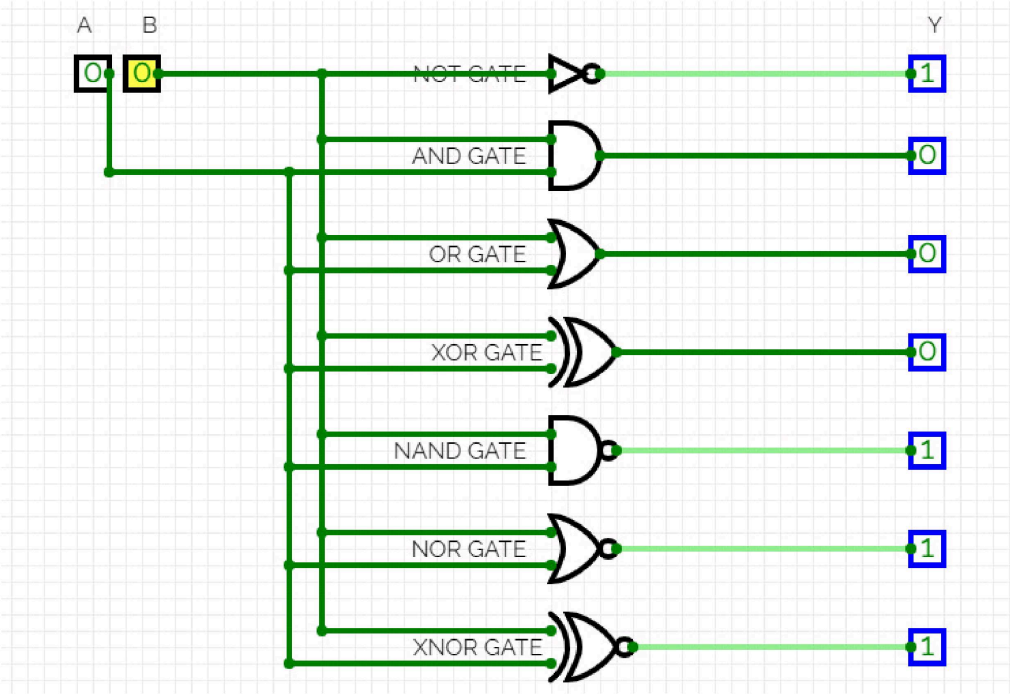
Logic Symbol of X-NOR gate

XNOR Truth Table		
A	B	Q
0	0	1
0	1	0
1	0	0
1	1	1

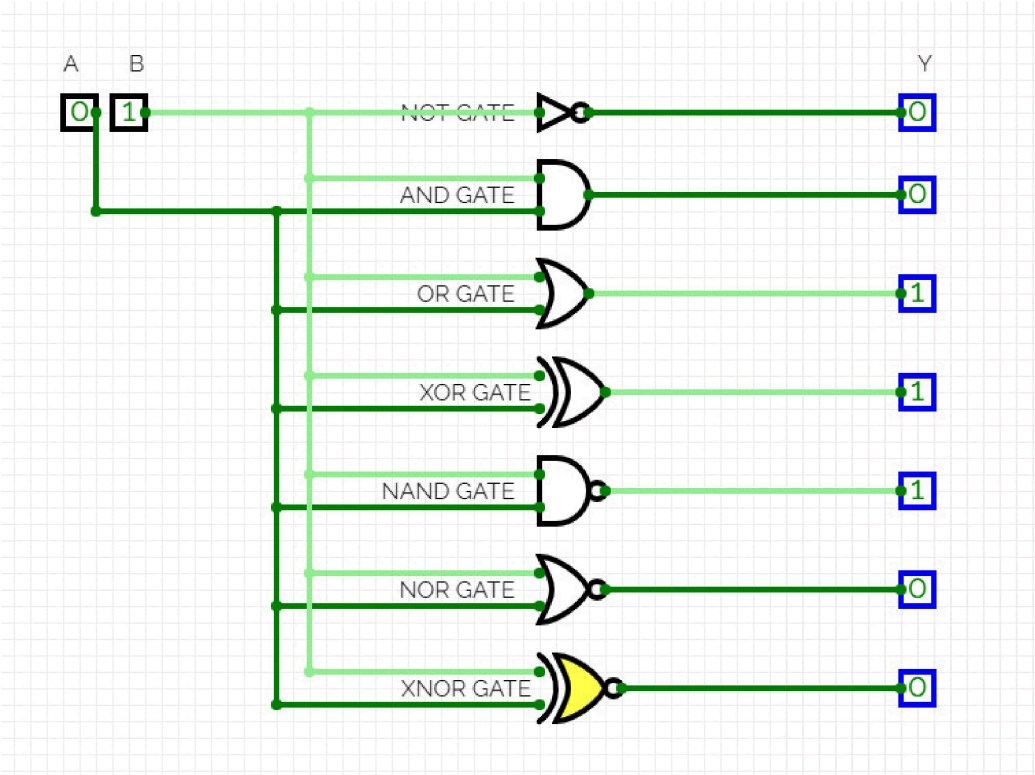
Truth Table of X-NOR gate

Observation:

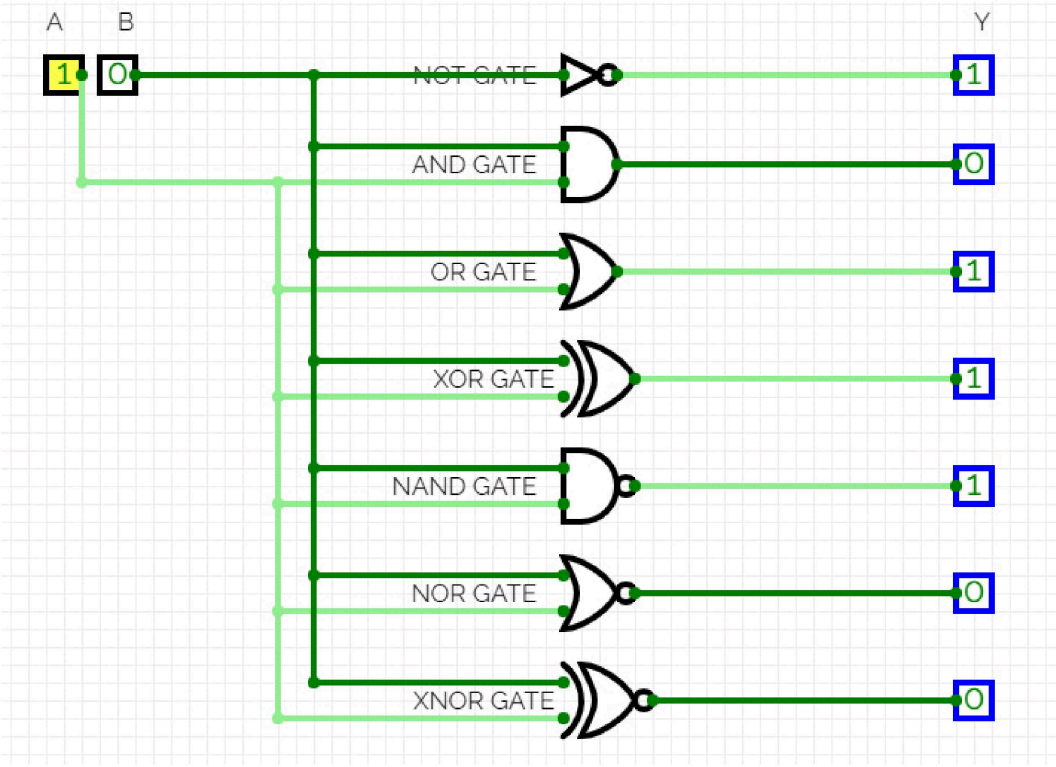
1) When A=0, B=0



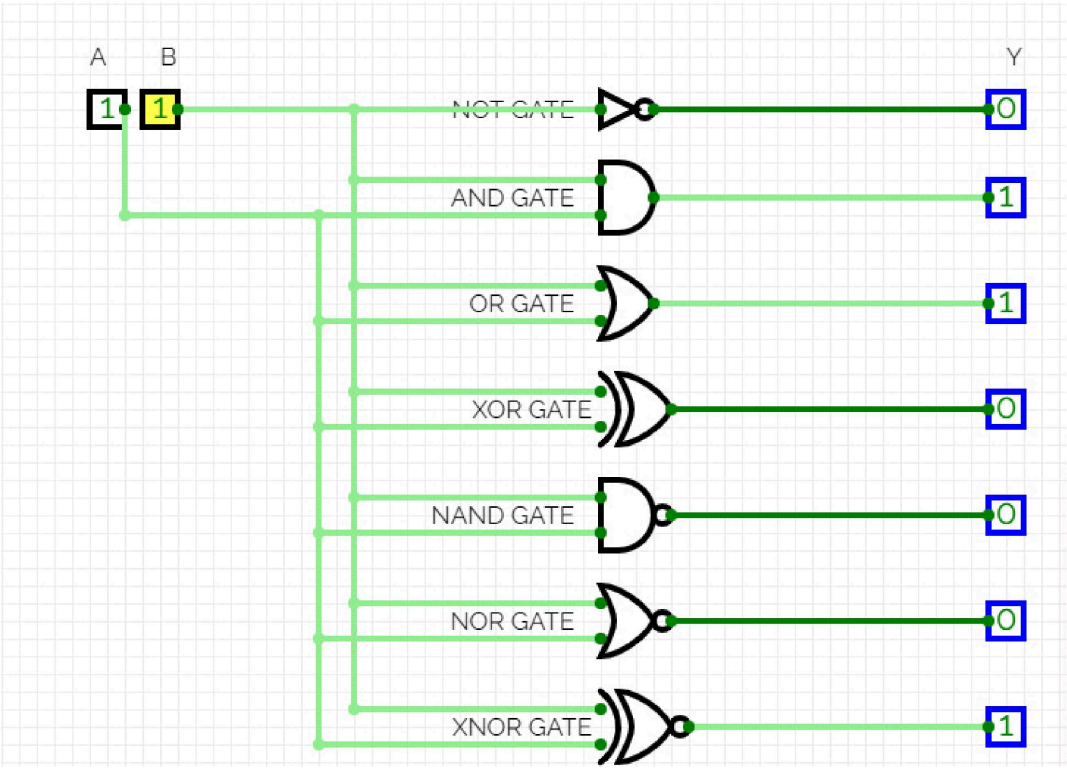
2) When A=0, B=1



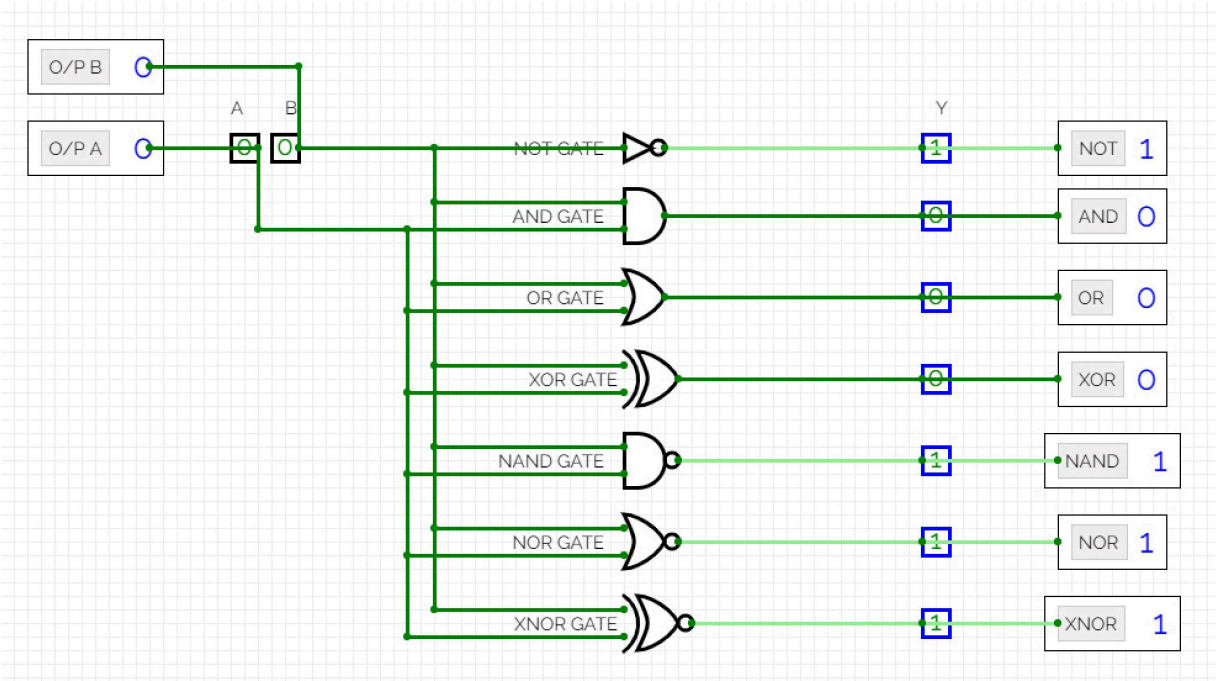
3) When A=1, B=0



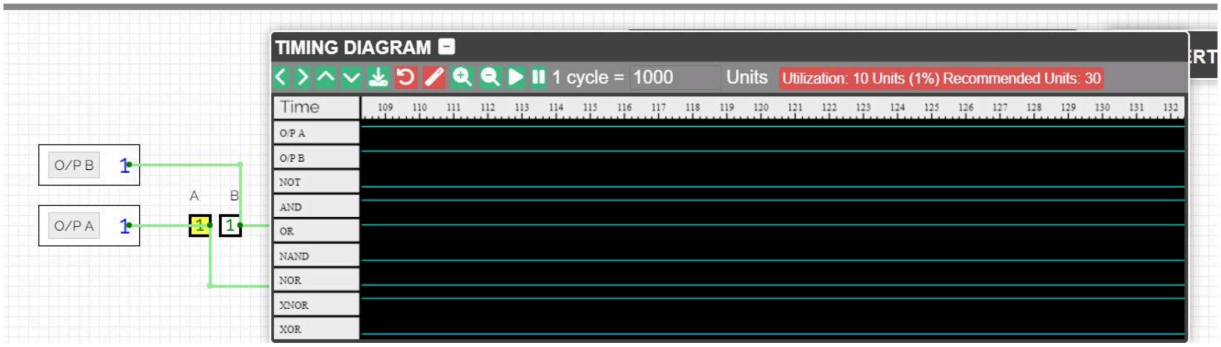
4) When A=1, B=1



Timing diagrams

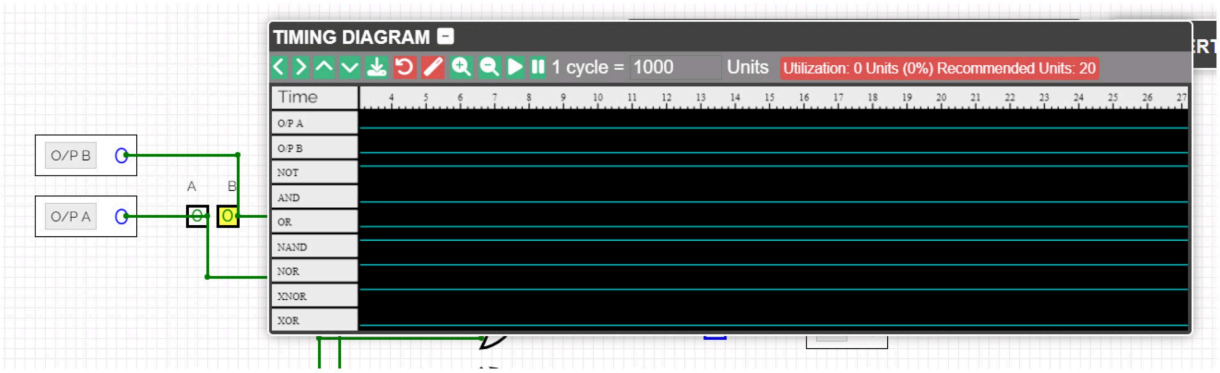


Flag arrangement

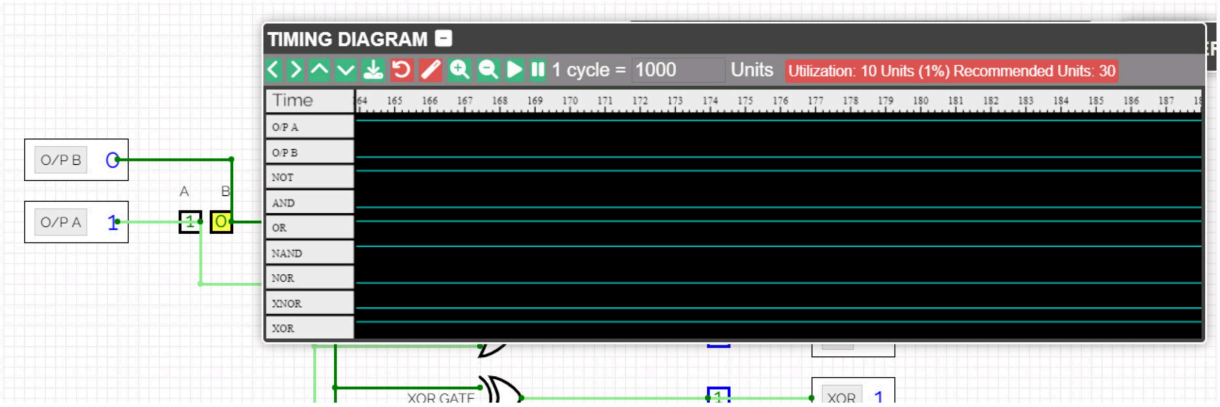


A=1, B=1

A=0,B=1



A=0, B=0



A=1, B=0

Result –

Logic Gates are successfully verified