Aneesh Panchal - 2K20/MC/21

Experiment IV

AIM:
Study and Analysis of Digital Gates

Theory:
Digital Gates (Logic Gates):

Digital electronic circuits operate with voltages of two logic level namely Logic Low and Logic High.

The range of voltages corresponding to Logic Low is represented with ‘0’.

Similarly, the range of voltages corresponding to Logic High is represented with ‘1’.

The basic digital electronic circuit that has one or more inputs and single output is known as Logic gate. Hence, the Logic gates are the building blocks of any digital system.

We can classify these Logic gates into the following three categories.

1. Basic gates
2. Universal gates
3. Special gates

Basic Gates:

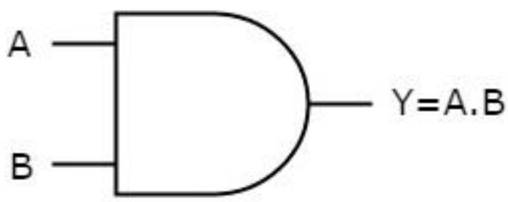
AND Gate:

An AND gate is a digital circuit that has two or more inputs and produces an output, which is the logical AND of all those inputs.

It is denoted by ‘.’

A	B	A **AND** B
0	0	0
0	1	0
1	0	0
1	1	1

Logic Table for AND



Symbol representation for AND

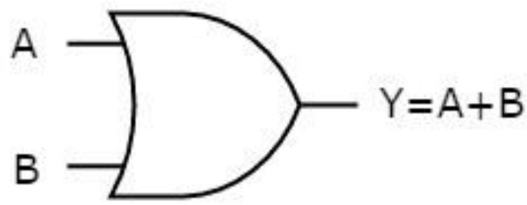
OR Gate:

An OR gate is a digital circuit that has two or more inputs and produces an output, which is the logical OR of all those inputs.

It is denoted by '+'

A	B	A **OR** B
0	0	0
0	1	1
1	0	1
1	1	1

Logic Table for OR



Symbol representation for OR

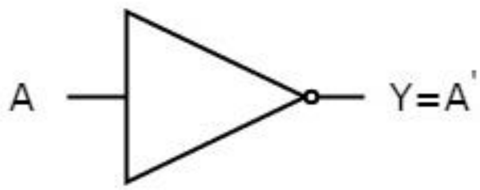
NOT Gate:

A NOT gate is a digital circuit that has single input and single output. The output of NOT gate is the logical inversion of input. Hence, the NOT gate is also called as inverter.

It is s denoted by '

A	**NOT** A
0	1
1	0

Logic Table for NOT



Symbol Representation for NOT

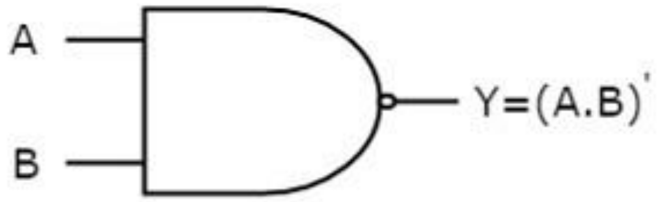
Universal Gates:

NAND Gate:

NAND gate is a digital circuit that has two or more inputs and produces an output, which is the inversion of logical AND of all those inputs.

A	B	A **NAND** B
0	0	1
0	1	1
1	0	1
1	1	0

Logic Table for NAND



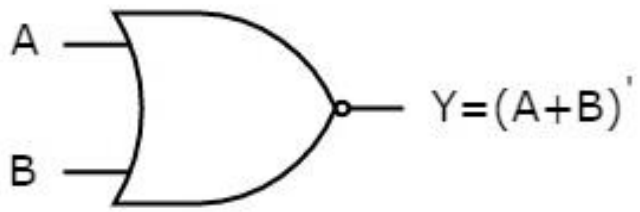
Symbol Representation for NAND

NOR Gate:

NOR gate is a digital circuit that has two or more inputs and produces an output, which is the inversion of logical OR of all those inputs.

A	B	A **NOR** B
0	0	1
0	1	0
1	0	0
1	1	0

Logic Table for NOR



Symbol Representation for NOR

Special Gates:

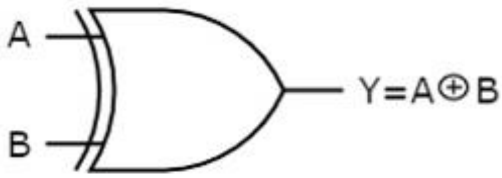
XOR Gate:

The full form of Ex-OR gate is Exclusive-OR gate. Its function is same as that of OR gate except for some cases, when the inputs having even number of ones.

It is denoted by '⊕'

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

Logic Table for XOR



Symbol Representation for XOR

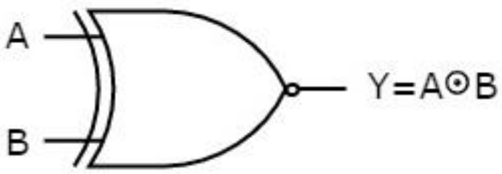
XNOR Gate:

The full form of Ex-NOR gate is Exclusive-NOR gate. Its function is same as that of NOR gate except for some cases, when the inputs having even number of ones.

It is denoted by 'ʘ'

A	B	A **XNOR** B
0	0	1
0	1	0
1	0	0
1	1	1

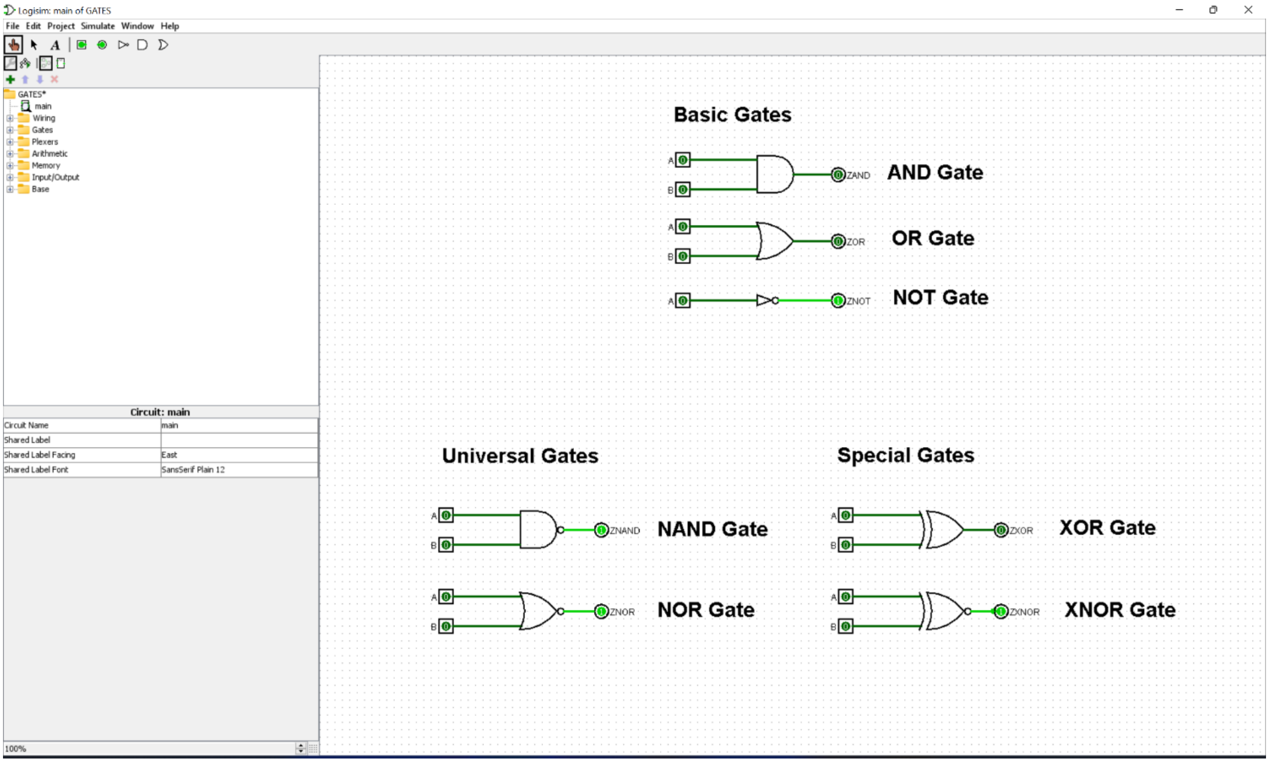
Logic Table for XNOR



Symbol Representation for XNOR

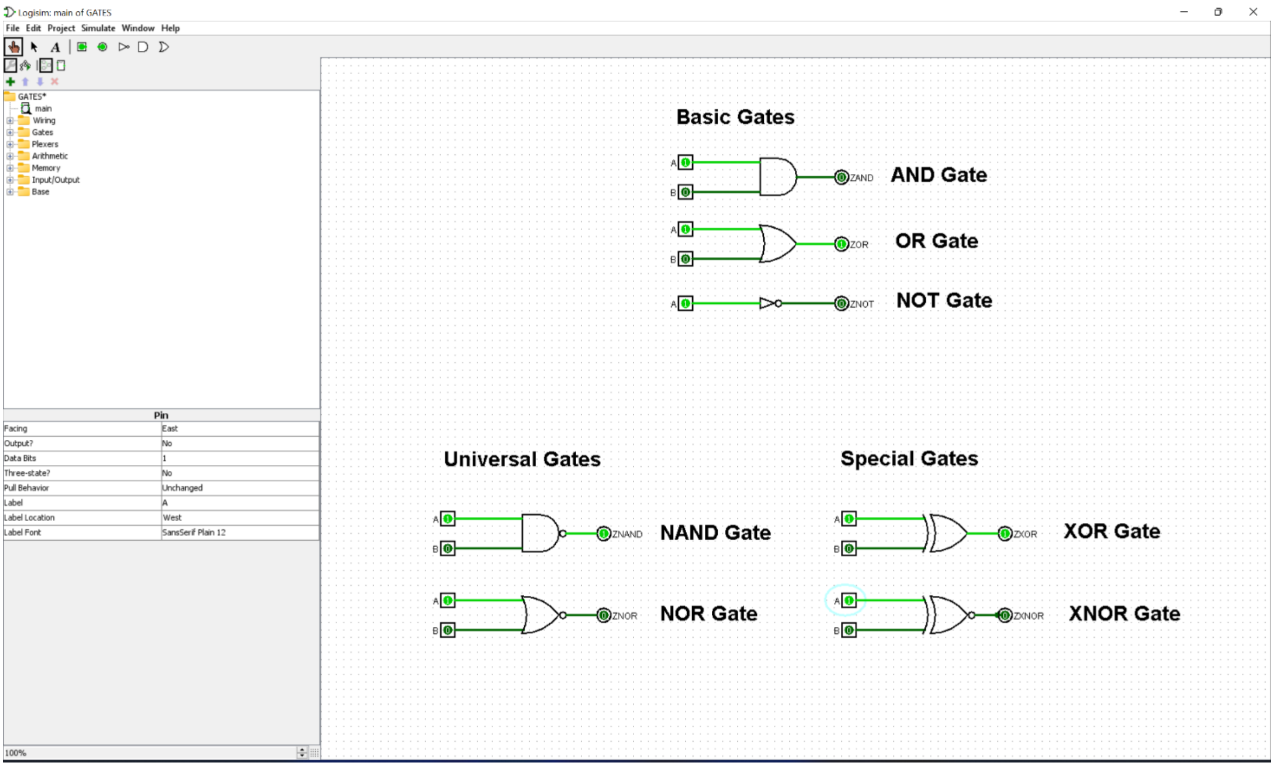
Observations:

When A = 0 and B = 0:



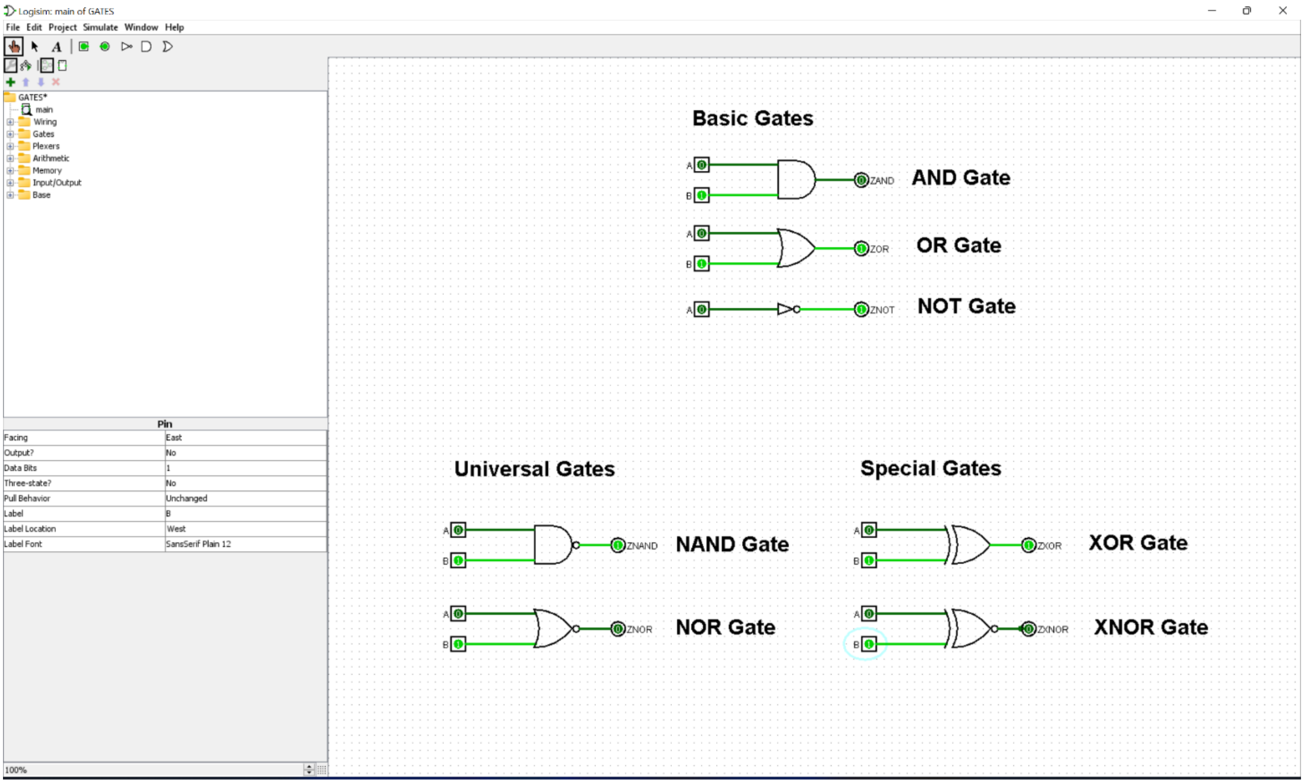
Basic Gates:	A AND B = 0	A OR B = 0	NOT A = 1
Universal Gates:	A NAND B = 1	A NOR B = 1	
Special Gates:	A XOR B = 0	A XNOR B = 1	

When A = 1 and B = 0:



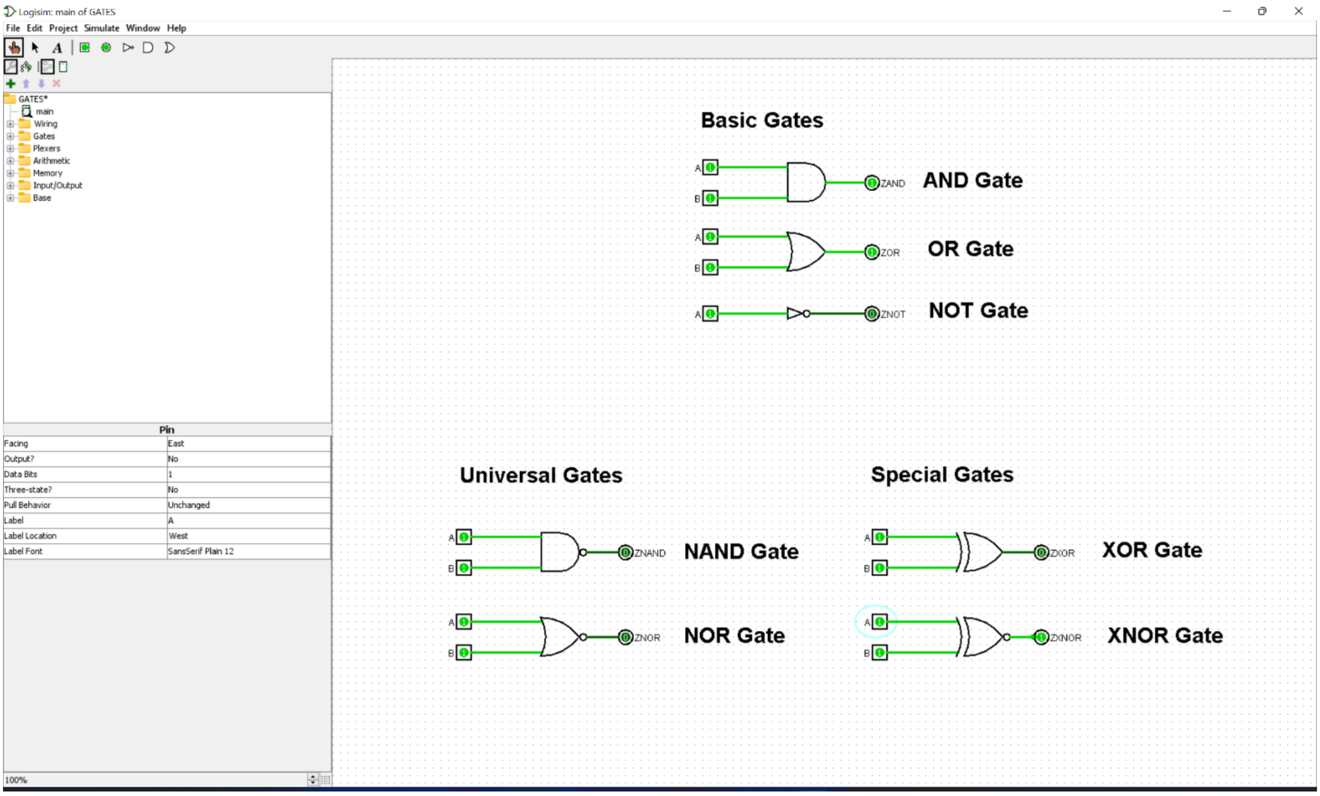
Basic Gates:	A AND B = 0	A OR B = 1	NOT A = 0
Universal Gates:	A NAND B = 1	A NOR B = 0	
Special Gates:	A XOR B = 1	A XNOR B = 0	

When A = 0 and B = 1:



Basic Gates:	A AND B = 0	A OR B = 1	NOT A = 1
Universal Gates:	A NAND B = 1	A NOR B = 0	
Special Gates:	A XOR B = 1	A XNOR B = 0	

When A = 1 and B = 1:



Basic Gates:	A AND B = 1	A OR B = 1	NOT A = 0
Universal Gates:	A NAND B = 0	A NOR B = 0	
Special Gates:	A XOR B = 0	A XNOR B = 1	