Digital Logic Circuit

Objectives

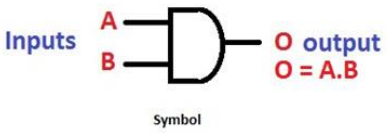
1. To study and verify the truth table for basic logic gates (AND, OR, NOT)

Components

1. IC 7408 2-input AND gates
2. IC 7432 2-input OR gates
3. IC 7404 2-input NOT gates
4. Resistors (10 x 1kΩ)
5. 10 LEDs

Theory

Logic gates are the basic building blocks of any logic circuit. Logic gates could have one or more input but produce one output. In computers, high voltage refers as "1" and low voltage refers as "0" which represent logic high and logic low respectively. The basic logic gates are AND, OR and NOT. Other logic gates are NAND, NOR, XOR, and XNOR which work at certain logic and can be constructed by the three basic logic gates. The input output combination is called truth table.

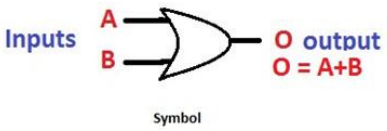


Symbol

Inputs		Output
A	B	O
0	0	0
0	1	0
1	0	0
1	1	1

Truth table

AND Gate

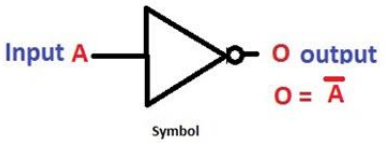


Symbol

Inputs		Output
A	B	O
0	0	0
0	1	1
1	0	1
1	1	1

Truth table

OR Gate

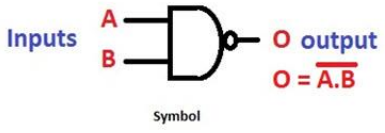


Symbol

Inputs	Output
A	O
0	1
1	0

Truth table

NOT Gate

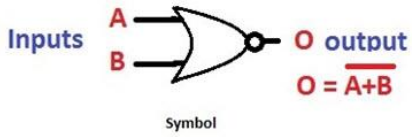


Symbol

Inputs		Output
A	B	O
0	0	1
0	1	1
1	0	1
1	1	0

Truth table

NAND Gate

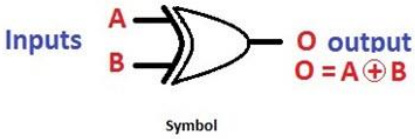


Symbol

Inputs		Output
A	B	O
0	0	1
0	1	0
1	0	0
1	1	0

Truth table

NOR Gate

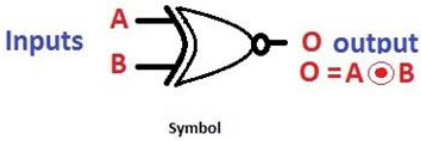


Symbol

Inputs		Output
A	B	O
0	0	0
0	1	1
1	0	1
1	1	0

Truth table

XOR Gate



Symbol

Inputs		Output
A	B	O
0	0	1
0	1	0
1	0	0
1	1	1

Truth table

XNOR Gate

Procedure

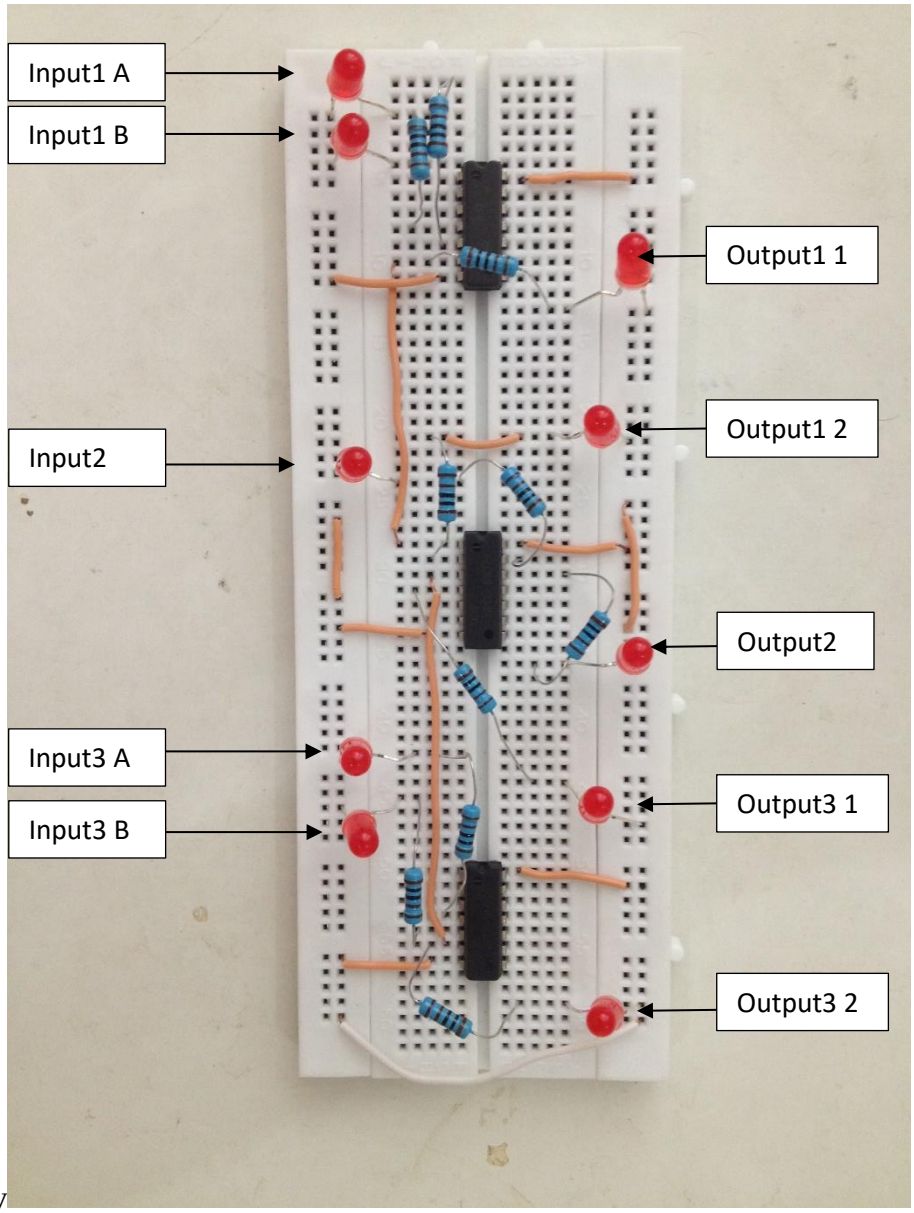
1. Click on the first IC and give input signals for the IC.
2. Observe the output of the IC on the LED
3. Determine the type of IC by looking at the truth table.
4. Repeat for the other two ICs. Note that the first and the last IC has two output. Hence, determine how the second output is obtained and what is the name of the combined logic gate.

Observation

1. Verify all the possible input combinations using truth table and LED indicator.

Inference

1. the first gate is AND gate, the second one is NOT gate and the third on is OR gate
2. The second output of the first and the third gates give out the output opposite of the first output. Hence, the second output of the first gate is NAND gate which is the combination of AND gate and NOT gate and the second output of the third gate is NOR gate which is the combination of OR gate and NOT gate.


Input1 A
Input1 B
Input2
Input3 A
Input3 B
Output1 1
Output1 2
Output2
Output3 1
Output3 2

CV