Digital Logic Design (Lab 2)

Experiment 2: Basic gates implementation using universal Gates

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Date: 16th March 2021 **Grade and Signature:** ……

CLO1	Recognize various logic gates			
Psychomotor/Affective	**Level1**	**Level2**	**Level3**	**Level4**
Report Marks (2)			**Total marks (10)**	

Objectives: To get understanding of basic logic gates and function of universal gates.

THEORY: All Logic gates can be implemented using universal gates which are NAND and NOR.

AND, OR and **NOT** are called basic gates as their logical operation cannot be simplified further. **NAND and NOR** are called universal gates as using only NAND or only NOR any logic function can be implemented. Using NAND and NOR gates and **De Morgan's Theorems** different basic gates & EX-OR & EX-NOR gates are realized.

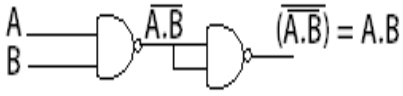
Equipment required:

Power Supply, Breadboard, Connecting wires, ICs 7400, 7402.

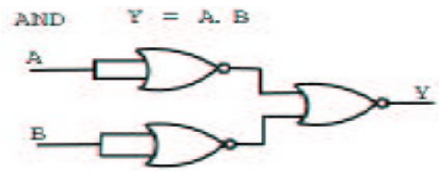
1. AND Gate (A . B)

Circuit Diagrams

Using NAND



Using NOR



Truth Table

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

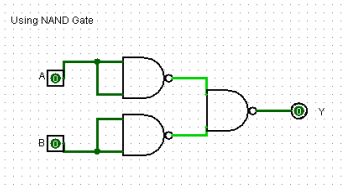
Procedure:

a) **Draw** the circuits with formulas at each step to show the implementation of all given gates.
b) **Simulate** your working in Multisim software.
c) **Implement** the circuit and record the input in truth table
d) Repeat the procedure for all given gates.

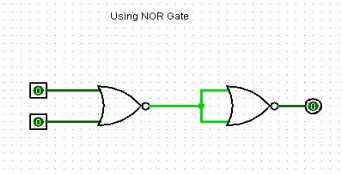
2. OR Gate (……..)

Circuit Diagrams

Using NAND



Using NOR



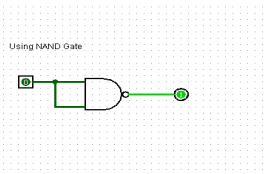
Truth Table

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

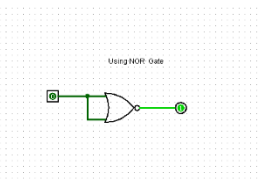
3. NOT Gate (…….)

Circuit Diagrams

Using NAND



Using NOR



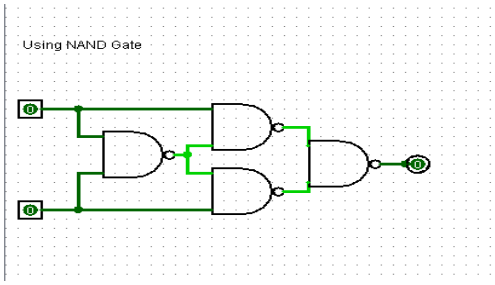
Truth Table

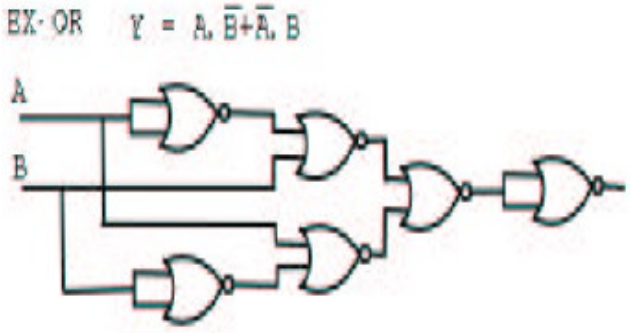
Input A	Output Y
0	1
1	0

4. EX-OR Gate (……..)

Circuit Diagrams

Using NAND **Using NOR**





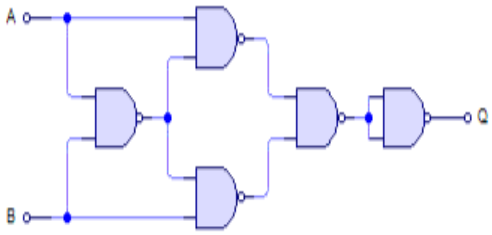
Truth Table

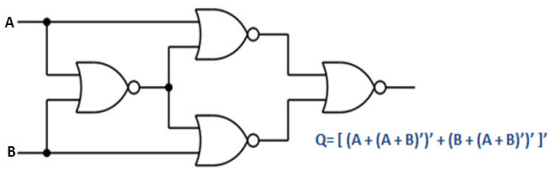
Input A	Input B	Output Y
0	0	0
0	1	1
1	0	1
1	1	0

5. EX-NOR Gate (……..)

Circuit Diagrams

Using NAND **Using NOR**





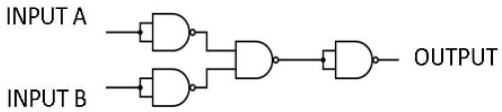
Truth Table

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

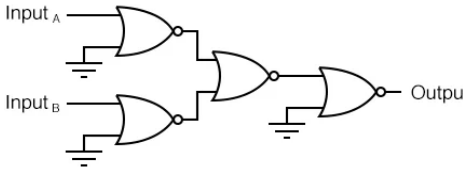
6. NOR using NAND and NAND using NOR Gates

Circuit Diagrams

NOR Using NAND



NAND Using NOR



Truth Table

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

Truth Table

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

7. Conclusion: Write what you learnt in your own words.

Digital electronics relies on the actions of just seven types of logic gates, called AND, OR, NAND (Not AND), NOR (Not OR), XOR (Exclusive OR) XNOR (Exclusive NOR) and NOT. The actions of any of these gates can also be described using Boolean statements. There is a one-to-one relationship between logic gates and Boolean expressions and how logic gates are combined to create full systems.