Experiment NO: 01

Name of the experiment: Studing different digital logic gates and designing of basic logic gates using Universal gates.

Group number: 03

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Student ID: 20-42119-1

Course Title: Digital Logic and Circuits Lab

Section: M

Date of experiment: 26|05|2022

Date of Submission: 13|06|2022

Objective of the experiment:

To understand the behaviour of the logic circuits using some Integrated circuit Chips (IC) and understanding the conversion of different digital logic function using Universal gates.

List of Components:

1. Digital trainer board
2. IC
3. Power Supply
4. wires.

IC List:

* 7408 : 1 Pcs
  7404 : 1 Pcs
  7402 : 1 Pcs
  7432 : 1 Pcs
  7400 : 1 Pcs
  7486 : 1 Pcs

3. Symbols, block diagram and figures:

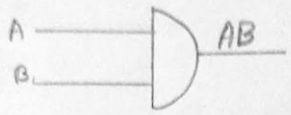


Fig: AND Gate

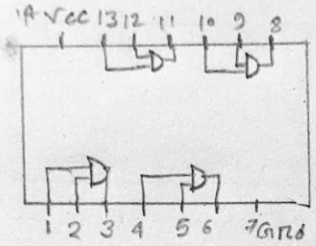


Fig: IC 7408

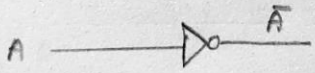


Fig: NOT gate

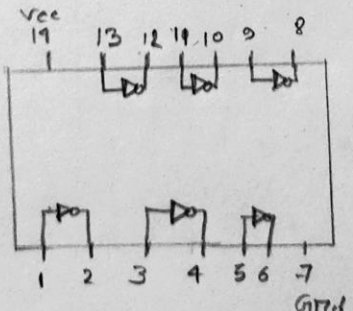


Fig: 7404

Fig: NOR Gate

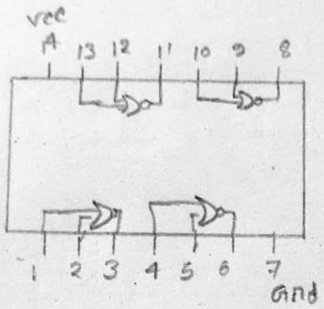


Fig: 7402

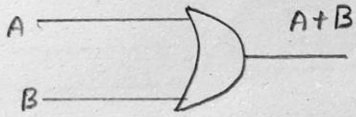


Fig: OR Gate

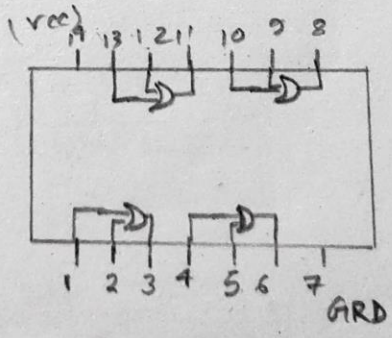


Fig: 7432

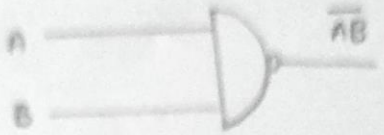


Fig: NAND gate

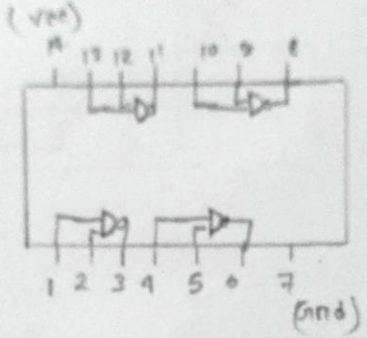


Fig: 7400

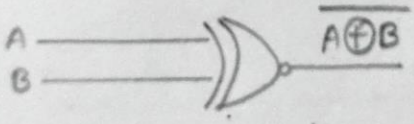


Fig: XOR gate

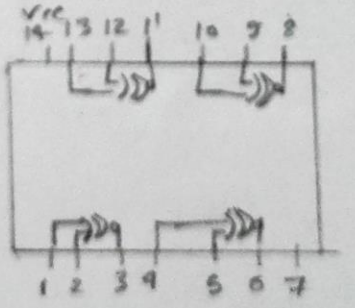


Fig: IC 7486

Data table & Calculation:

1. FOR AND gate:

A	B	output
0	0	0
0	1	0
1	0	0
1	1	1

2. FOR NOT gate:

A	output
0	1
1	0

3. NOR gate:

A	B	output
0	0	1
0	1	0
1	0	0
1	1	0

4. OR gate:

A	B	output
0	0	0
0	1	1
1	0	1
1	1	1

5. NAND gate:

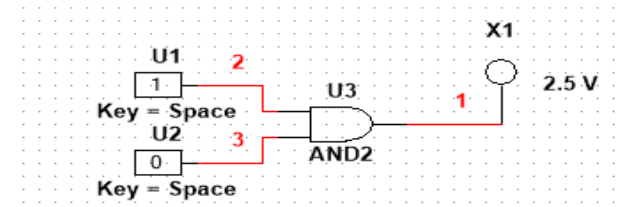
A	B	output
0	0	1
0	1	1
1	0	1
1	1	0

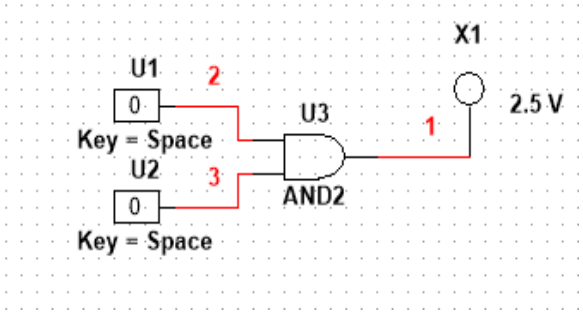
6. XOR :

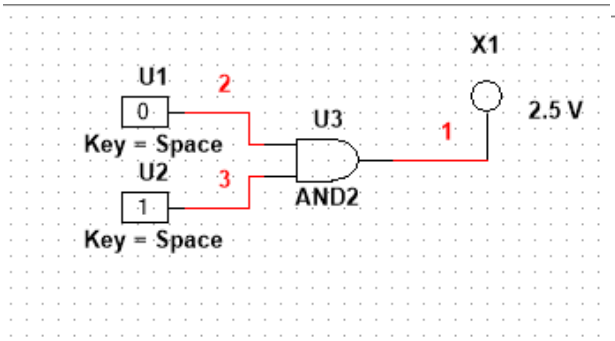
A	B	output
0	0	0
0	1	1
1	0	1
1	1	0

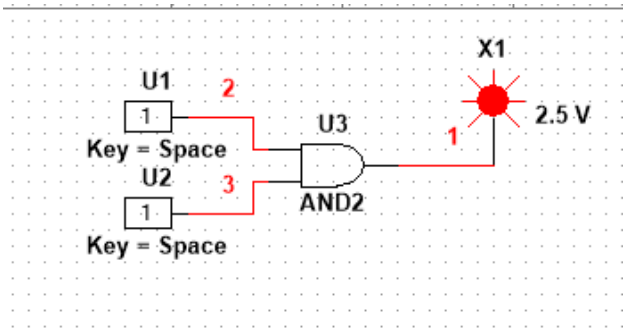
Simulation

AND Gate:

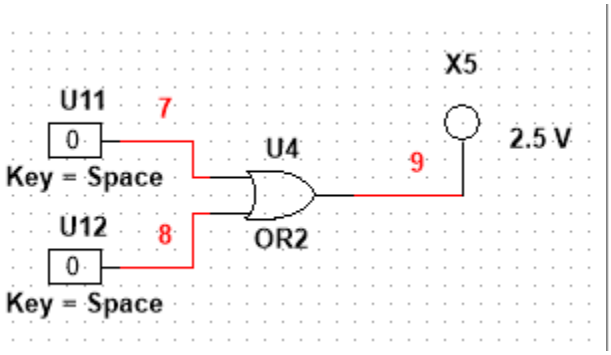


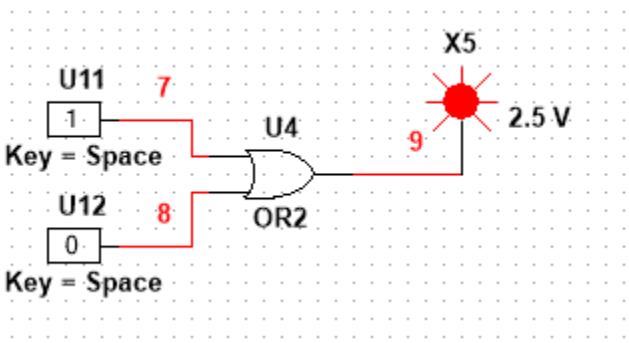


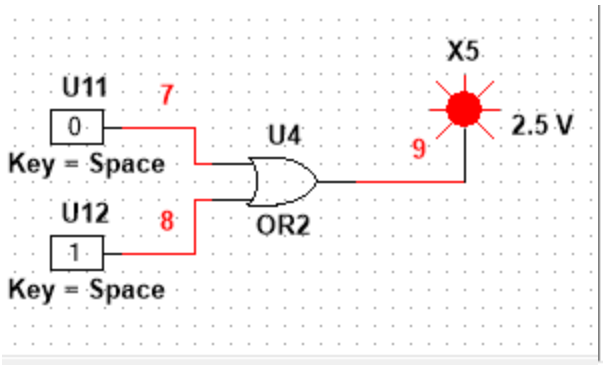


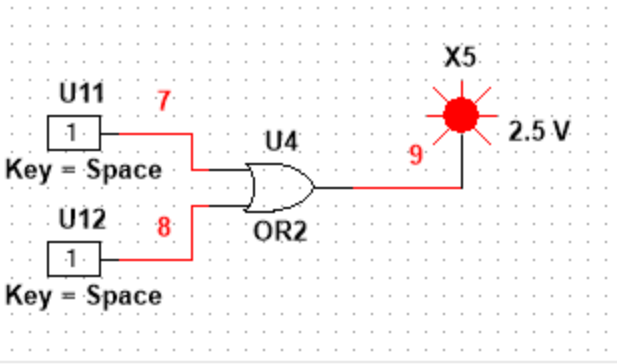


OR Gate

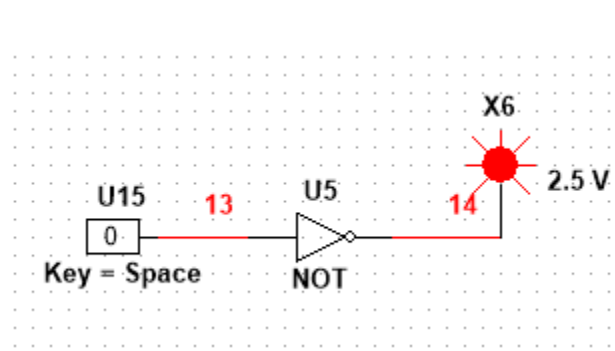


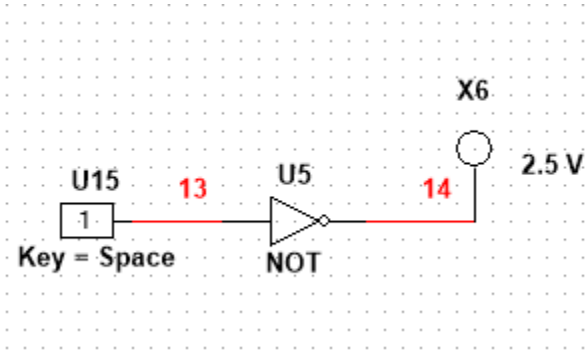




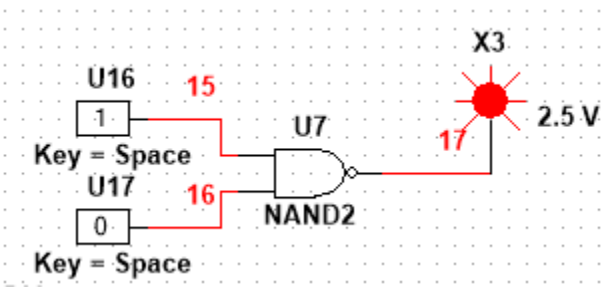


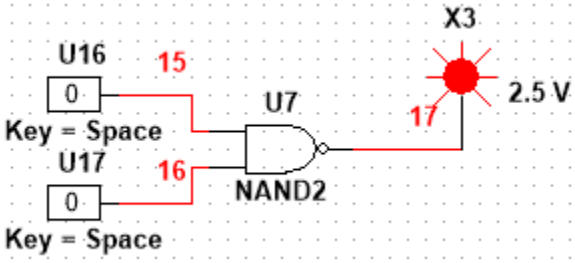
NOT Gate

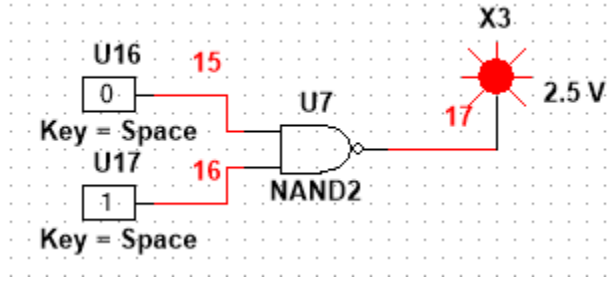


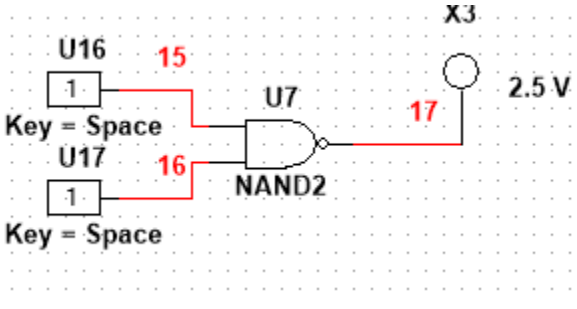


NAND

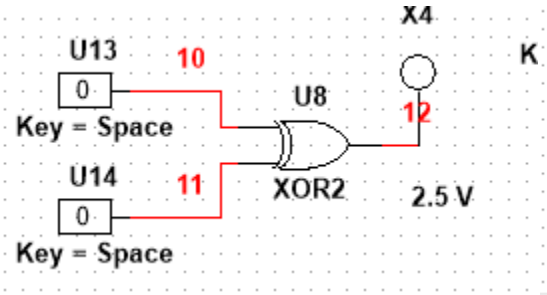


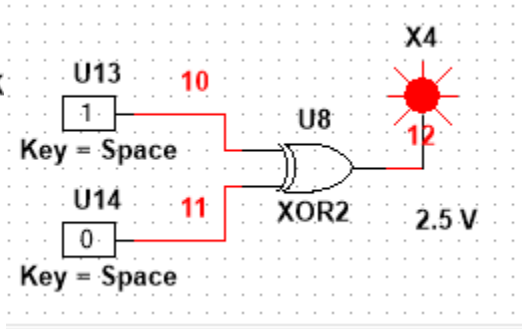


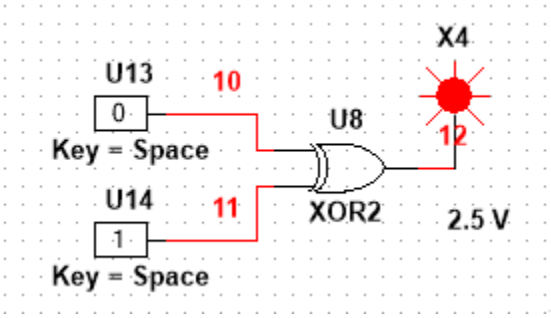


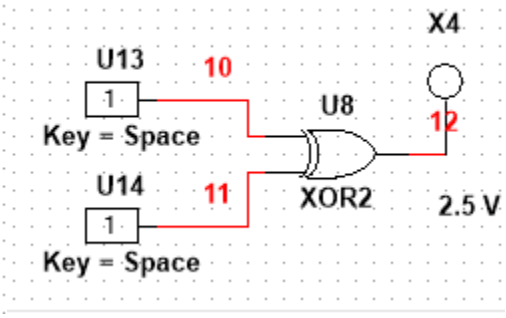


XOR

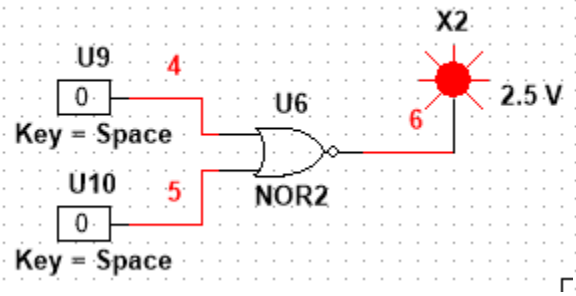

X4
U13
10
0
Key = Space
U8
12
U14
11
0
Key = Space
XOR2
2.5 V

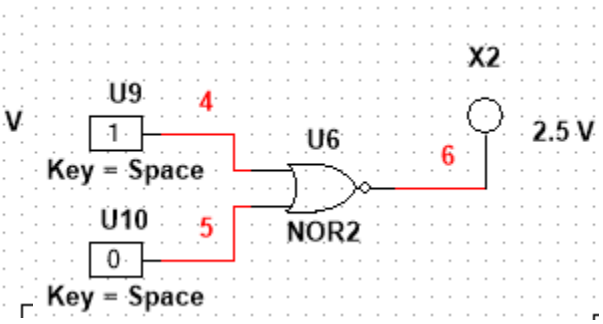

K
X4
U13
10
1
Key = Space
U8
12
U14
11
0
Key = Space
XOR2
2.5 V

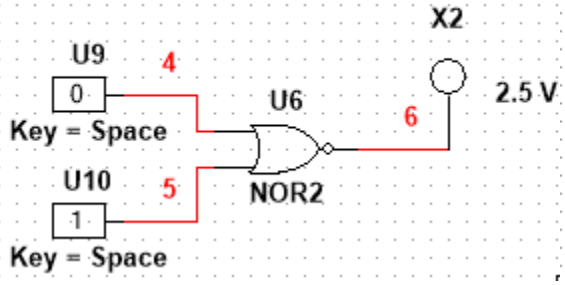

X4
U13
10
0
Key = Space
U8
12
U14
11
1
Key = Space
XOR2
2.5 V


X4
U13
10
1
Key = Space
U8
12
U14
11
1
Key = Space
XOR2
2.5 V

NOR


X2
U9
4
0
Key = Space
U6
6
2.5 V
U10
5
0
Key = Space
NOR2


X2
U9
4
1
Key = Space
U6
6
2.5 V
U10
5
0
Key = Space
NOR2


X2
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Key = Space
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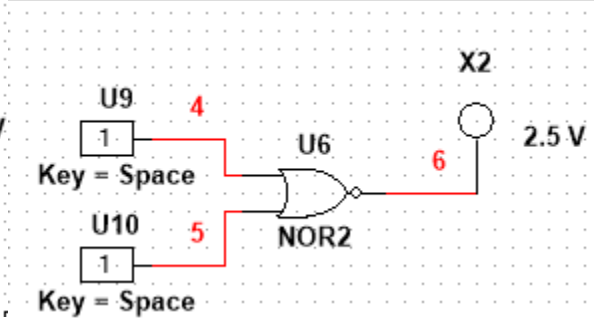
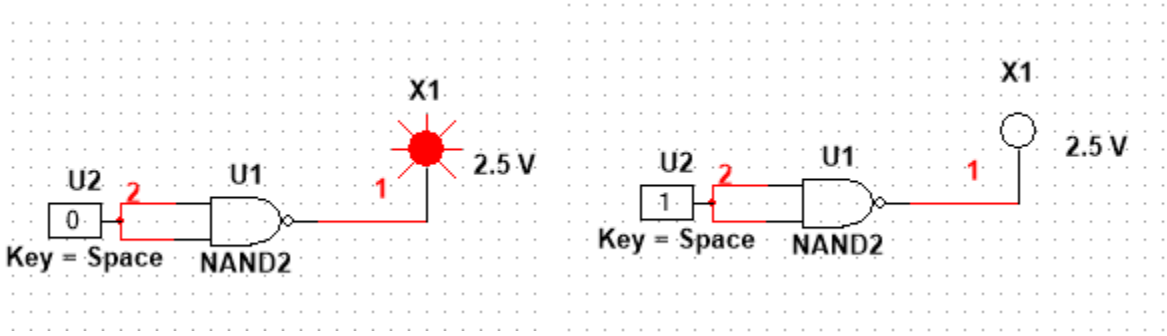
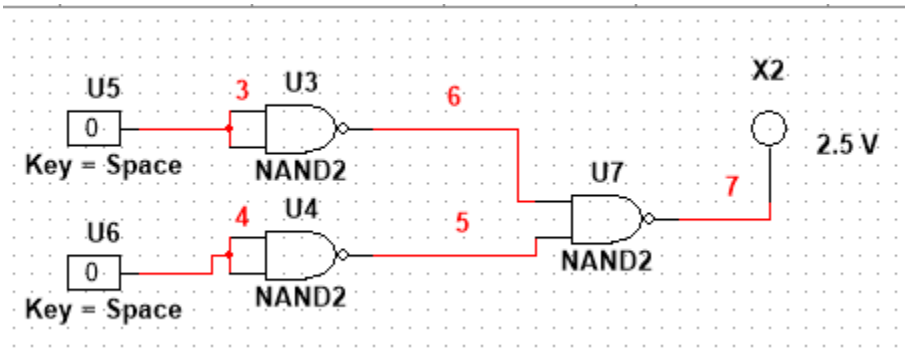
U10
5
1
Key = Space
NOR2


X2
U9
4
1
Key = Space
U6
6
2.5 V
U10
5
1
Key = Space
NOR2

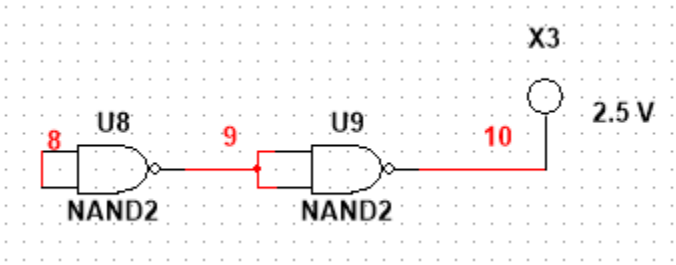
NOT gate Using NAND



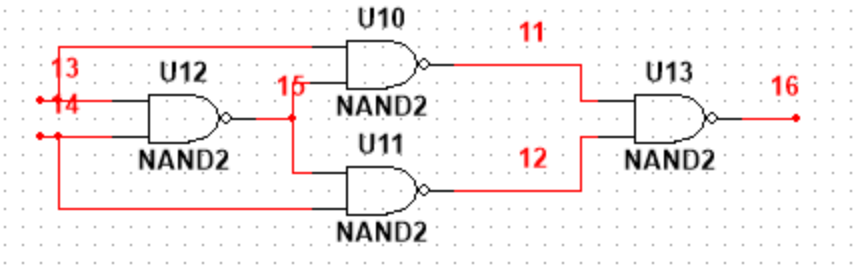
OR gate Using NAND



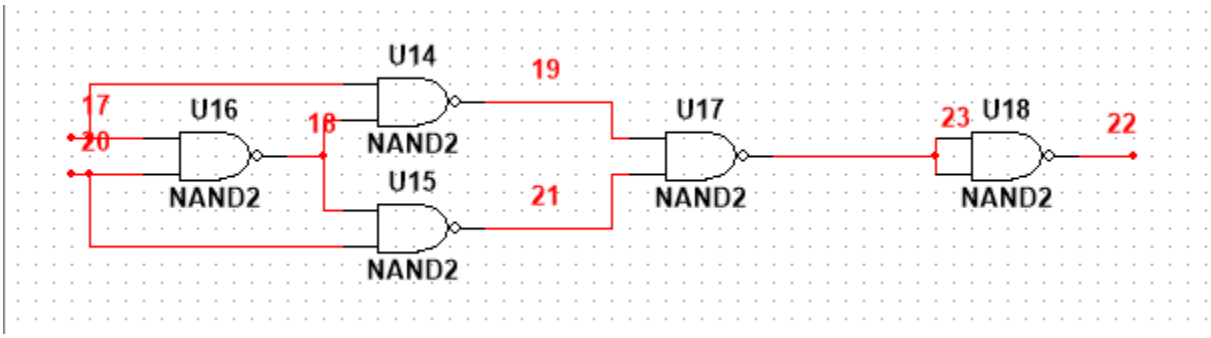
AND gate Using NAND



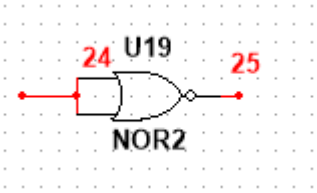
XOR gate Using NAND



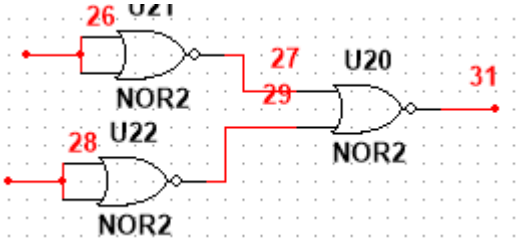
XNOR gate Using NAND



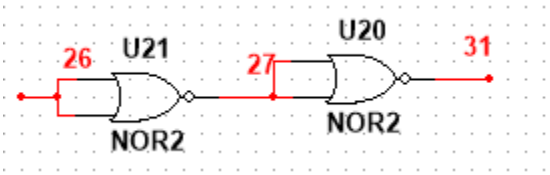
NOT gate Using XOR



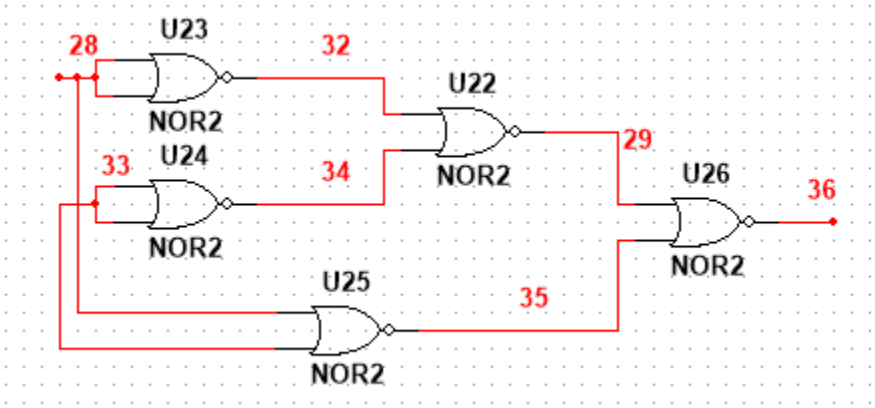
AND gate Using XOR



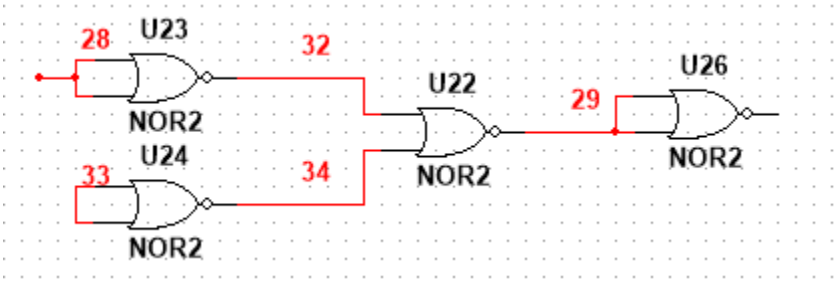
OR gate Using NOR



XNOR gate Using NOR



XOR gate using NOR



Discussion: The term logic refenes to a human reasoning that enables to us to make various conditional proposition such as "this statement is true" [1]. Various digital logic gates act on various voltage level. 3 Fundamental gates are AND, OR and NOT and NAND and NOR are universal gates. XOR and XNOR are exclusive gate.

In this experiment we have seen various Ic acts according to its logical input. In a IC, there are various logic gates. In AND, OR, ~~NOT~~ XOR, XNOR, NAND etc gates are assigned into it. For them, pin NO. 1, 2, 4, 5, 9, 10, 12, 13 are considered to be input and 3, 6 11 are output. NOT gate input is 1, 3, 5, 9, 11, 13 and output lines are 2, 4, 6, ~~8~~, 10, 12. 7 is consider as ground and 14 is consider as Vcc or Power input. Inside digital board, we have connected the wires and pins according to it and to see the output we have connected it into the digital board. The

input signal is generated from digital board switch. "The combination of inputs depend only on the present input" [2]. During experiment the pin configuration understanding is very much important as the input outputs are very much likely related to this. During experiment, some IC circuits were not functioning properly due to pin damage or excessive use of circuits during its lifetime. Even digital board output side may not show the correct answer. To get rid of this, IC chips need to be update regularly new pins should be added and use of low voltage need to be ensured.

The experiment, however was a success, still the result may not be 100 percent correct due to some fault. But it can be consider as minor fault and the error percentage maybe 0.03%. which is negiable.

Conclusion:

In our experiment, we want to verify various logic circuits using digital board. In the theoretical truth table, and experimental truth table shows the same result. So, we can say that we have achived the goal and digital gates are verified.

I Remarks:

(i) Digital gates acts differently in various IC and various output

(ii) IC packages are classified according to the way they are mounted in PCB

(iii) IC Pin numbers are assigned into anticlock wise rotation.

(iv) OR gate acts like Parallel circuit

(v) AND gate acts like series circuit

(vii) NOT gate is a Complement gate.

(viii) IC is designed with multiple logic circuits.

List of reference:

1. [1][2] Digital Logic and Computer design [M. Zafrul Mulk] [pages, 19, 21] [1st edition]

2. Digital Fundamentals [James Floyed].