

Adama Science and Technology University

# School of Electrical Engineering and Computing

# Department of Software Engineering

**Course Name: DLD**

**Course Code: ECE3201**

**LAB-NO: 1**

## Title: THE LOGIC GATES

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## Lab – 1: THE LOGIC GATES

#### Objectives:

* To implement these logic gates using 74 families TTL logic gates IC.
* To investigate the output of each gate based on the input with different type of logic gate.

#### Material requirements:

1. digital ICs
2. Limo rose patch board
3. connecters

## Theoretical Background

## Digital logic gates are the foundation of all digital circuits. The output of these gates is either "I" or "0" based on the input value. There are different types of this logic gates, among this are AND gate, OR gate, NOT gate or sometimes it is called an INVERTER, NOR gate, NAND gate, the XOR. Each of these gates their own manufacturer model number just as showed in fig. below.

## Procedures

#### Implement AND Gate

1. Firstly, we connected pin 7 to ground & pin 14 to +5v.
2. Then we connected pin 1 & pin 2 to switch
3. Following this we connected pin 3 to LED.
4. Next, we turned on the power switch.
5. Finally we observed the reading that the LED gives and recorded it.

#### Implement OR, XORAND NAND Gate

1. Firstly, we connected pin 7 to ground & pin 14 to +5v.
2. Then we connected pin 1 & pin 2 to switch
3. Following this we connected pin 3 to LED.
4. Next, we turned on the power switch.
5. Finally, we observed the reading that the LED gives and recorded it.

#### Implement NOT Gate

1. Firstly, we connected pin 7 to ground & pin 14 to +5v.
2. Then we connected pin 1 to switch
3. Following this we connected pin 2 to LED.
4. Next, we turned on the power switch.
5. Finally, we observed the reading that the LED gives and recorded it.

#### Implement NOR Gate

1. Firstly, we connected pin 7 to ground & pin 14 to +5v.
2. Then we connected pin 2 & pin 3 to switch
3. Following this we connected pin 1 to LED.
4. Next, we turned on the power switch.
5. Finally, we observed the reading that the LED gives and recorded it

#### Implement XNOR Gate

1. Firstly, we connected pin 7 to ground & pin 14 to +5v for both XOR, NOT Gates.
2. Then we connected pin 1 & pin 2 to switch of the XOR gate.
3. Following this we connected pin 3 of XOR to pin 1 of NOT GATE.
4. Next, we turned on the power switch.
5. Finally we observed the reading that the LED gives and recorded it.

## Result and Discussion

From the experiments we have done we have obtained the following data.

#### Implement AND Gate

AND

|  |  |  |
| --- | --- | --- |
| P1 | P2 | P3 |
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

#### Implement OR, XOR & NAND Gate

OR

|  |  |  |
| --- | --- | --- |
| P1 | P2 | P3 |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

XOR

|  |  |  |
| --- | --- | --- |
| P1 | P2 | P3 |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

NAND

|  |  |  |
| --- | --- | --- |
| P1 | P2 | P3 |
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

#### Implement NOT Gate

NOT

|  |  |
| --- | --- |
| P1 | P2 |
| 0 | 1 |
| 0 | 1 |
| 1 | 0 |
| 1 | 0 |

#### Implement NOR Gate

NOR

|  |  |  |
| --- | --- | --- |
| P1 | P2 | P3 |
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

#### Implement XNOR Gate

* In this gate because we don’t have XNOR gate we combined XOR and NOT gates.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P1(XOR) | P2(XOR) | P3(XOR) | P1(NOT) | P2(NOT) |
| 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 |

## Conclusion

* The OR operation produces a result of 1 when any of the input variables is 1.
* The OR operation produces a result of 0 only when all the input variables are 0.
* The AND operation is performed exactly like ordinary multiplication 1s and 0s. The output equal to 1 occurs only for the single case where all inputs are 1. The output is 0 for any case where one or more inputs are 0.
* NOT GATES always has only a single input and its output logic level is always opposite to the logic level of this input.
* The NOR gate is actually a NOT OR gate in other words, the output of an OR gate is inverted to form a NOR gate.
* The NAND gate is a NOT AND, or an inverted AND function.
* XOR GATE output is HIGH only when the two inputs are at different levels.
* XOR GATES a HIHG output whenever the two inputs are at the same level. IT should be apparent that the output of the XNOR circuit is the exact inverse of the output of the XOR circuit.

1. What are the manufacturer number of 74 families TTL ICs used in this activity for AND, OR, NOR, NOT, XOR and NAND gate?

AND = 7408

OR = 7432

NOR = 7402

NOT = 7404

XOR = 7486

NAND = 7400

1. What is the function of PIN14 and PIN 7 in 74 families TTL IC?

* For most of the 7400 chips, pin 7 is ground connection and pin 14 is the +5v power supply.

1. What is the manufacturer number of three input of AND& NAND gate?

***“We have neither received nor provided any help on the writing of this lab report.”***

**THANK YOU!**