University of Sri Jayewardenepura
Faculty of Computing
CCS 1552 - Computer System Architecture

Experiment No: 01

Experiment: Exploring Logic Gates – The NOT Gate

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1. Objectives

By the end of this lab, students will be able to:

1. Understand the function of the NOT gate (inverter) in digital logic circuits.

2. Build and test a NOT gate circuit using basic electronic components.

3. Learn correct LED connection and observe input-output behavior.

4. Develop basic skills in breadboard wiring and electronic troubleshooting.

2. Materials Required

| Component	Quantity	Notes
7404 IC (Hex NOT Gate)	1	OR any NOT gate IC
Breadboard	1	Standard size
Jumper wires	10–15	Male-to-male
LED	2	For input and output indication
Resistor (1kΩ)	1	Pull-down resistor
Resistor (220Ω)	2	For current limiting of LED
Push button	1	Optional, for input control
5V DC Power supply	1	Can use battery or lab PSU

3. Theory

- A NOT gate inverts the input logic: HIGH → LOW, LOW → HIGH.
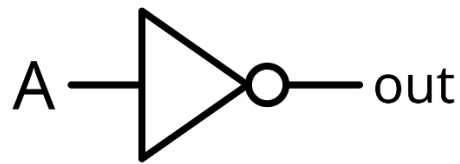
- **Truth Table of NOT Gate:**

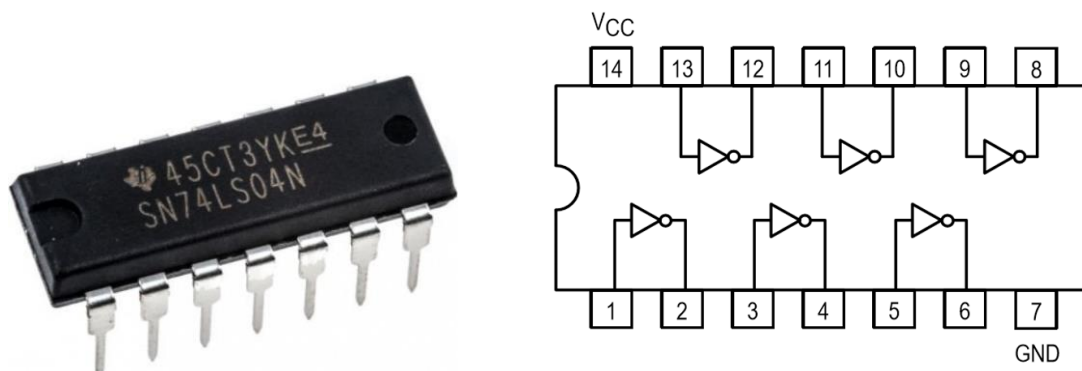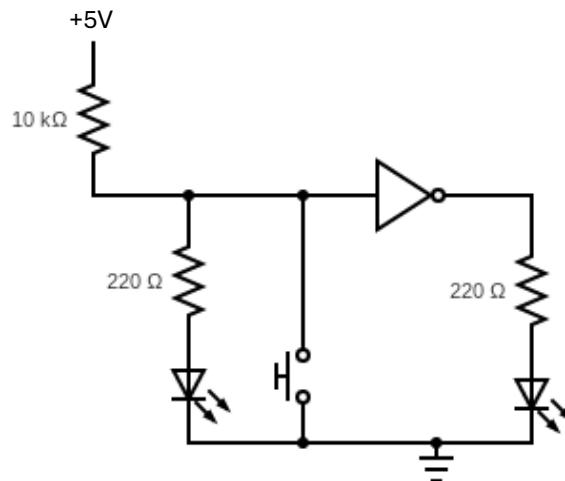| Input (A)	Output (Y)
0	1
1	0

- **LED Basics:**
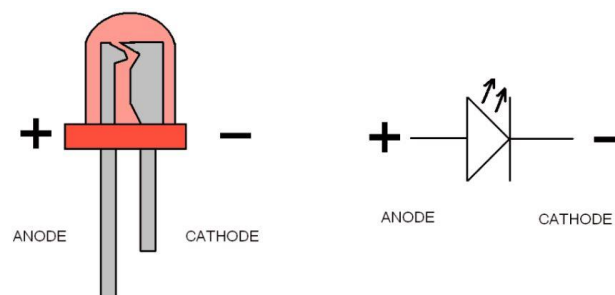
- LEDs are polarized components.
- **Anode (+)**: longer leg, connects to positive side.
- **Cathode (−)**: shorter leg, connects to GND.
- Use a resistor in series to limit current and prevent damage.

5. Circuit Diagram

Diagram 1: 7404 IC

Diagram 2: NOT Gate Circuit with Push Button and LED

5. Step-by-Step Procedure

A. Setup IC

1. Place the 7404 IC on the breadboard, straddling the center gap.

2. Connect Pin 14 (Vcc) to +5V rail.

3. Connect Pin 7 (GND) to 0V rail.

B. Connect Push Button

1. Place push button across the breadboard gap.

2. Connect one side to +5V rail.

3. Connect the other side to input pin of NOT gate (Pin 1).

C. Connect Output

1. Connect output pin (Pin 2) to LED anode (long leg).

2. Connect LED cathode (short leg) through 220 Ω resistor to GND rail.

D. Test the Circuit

1. Press push button (Input HIGH = 1). LED should be OFF (Output LOW).

2. Release button (Input LOW = 0). LED should be ON (Output HIGH).

6. Observations Table

Input (A)	Input LED Status	Output LED Status	Output (Y)
0	ON		
1	OFF		

7. Activities

1. Single NOT Gate Test: Build circuit and fill truth table.

2. Series NOT Gates: Connect output of first gate to input of second gate and observe LED behavior.

3. LED Orientation Test: Swap LED terminals and explain why LED does not light in one orientation.

4. Build double-inversion circuit and verify output matches original input.

8. Questions

1. Explain the behavior of the LED for each input.

2. What happens when two NOT gates are in series?

3. Why is a resistor required in series with the LED?

4. How would the circuit behave if LED terminals were reversed?

5. Suggest real-life applications of a NOT gate.

9. Safety Instructions

*   Do not exceed 5V for the IC.

*   Ensure correct LED polarity.

*   Handle breadboard connections carefully to avoid short circuits.

*   Disconnect power supply when adjusting the circuit.