IIITB COMET FOUNDATION

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Abstract

This project demonstrates the behavior of the NAND gate using Pico2w, push buttons as logic inputs, and an LED to indicate output. It validates the concept that NAND is a universal gate.

1. Components

Component	Qty
Pico2w	1
Push Buttons	2
LED	1
220Ω Resistors	3
Breadboard	1
Jumper Wires	10
Laptop with Thonny IDE	1

Table: Components used

2. Setup Instructions

- Connect button A to GP14 with pull-down logic.
- Connect button B to GP15 similarly.
- Connect LED anode to GP13 through a 220 resistor.
- Common ground for both buttons and LED cathode.
- Use Thonny IDE to upload the code.

3. NAND Gate Logic

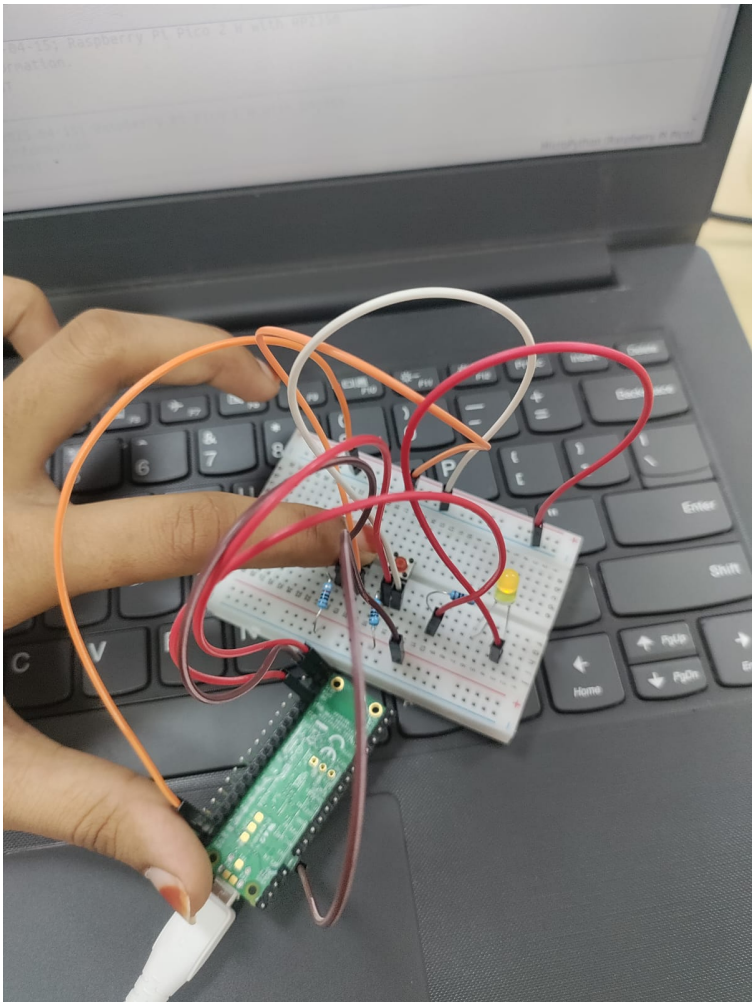
$$\text{NAND}(A, B) = \overline{A \cdot B}$$

$$\text{Output} = \begin{cases} 1 & \text{if } A = 0 \text{ or } B = 0 \\ 0 & \text{if } A = 1 \text{ and } B = 1 \end{cases}$$

4. Observation Table

A	B	$LED(Output)$
0	0	1
0	1	1
1	0	1
1	1	0

5. Circuit Image



6. MicroPython Code (Thonny)

```
from machine import Pin
from time import sleep

# Define pushbuttons
button_a = Pin(14, Pin.IN, Pin.PULL_DOWN)
button_b = Pin(15, Pin.IN, Pin.PULL_DOWN)

# Define LED
led = Pin(13, Pin.OUT)

while True:
    a = button_a.value()
    b = button_b.value()

    # NAND logic: output is off only if both inputs are high
    if a == 1 and b == 1:
        led.value(0)  # LED off
    else:
```

```
        led.value(1)   # LED on

    sleep(0.1)
```

7. Conclusion

This implementation verifies the behavior of a NAND gate using Pico2w.