Green University of Bangladesh
Department of Computer Science and Engineering (CSE)
Faculty of Sciences and Engineering

Semester: (Fall, Year : 2022) , B.Sc. in CSE (Day)

PROJECT REPORT

Course Title: Digital Logic Design Lab

Course Code: CSE -204 Section: PC-213_DA

Lab Project Name : Automatic Night Light Using NAND Gate.

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Project Report Status

Marks: …… Signature:.....

Comments:..... Date:.....

1.1 Introduction

A night light circuit is a circuit in which a light will turn on when the environment becomes dark. It is a popular commercial product that is used in many places such as for backyard lights for when it gets dark for automatic illumination. In this project, we will build a night light circuit using a NAND gate chip.

1.2 Objective

The goal of this project is to make a Night Light with the help of a photoresistor and a NAND Gate.

- Use in backyard
- Use in Road
- To use Photoresistor
- Understand basic concept of circuit
- Build an automatic night light

2.1 Circuit Diagram

The pinout of the 7400 quad NAND gate chip is shown below, so that we can see how to connect it in the circuit.

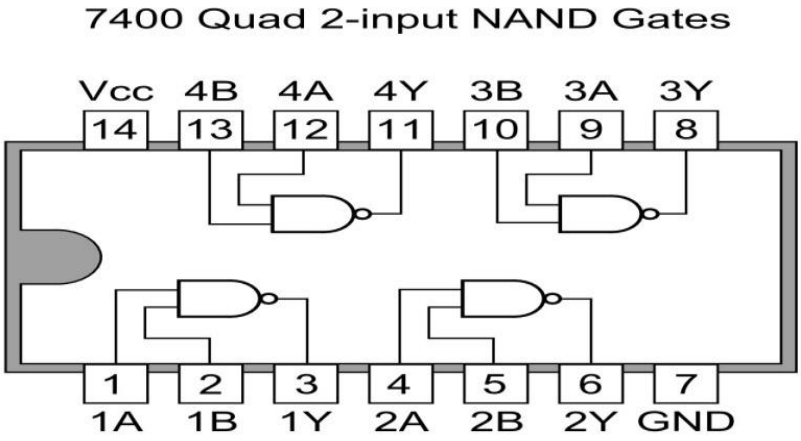
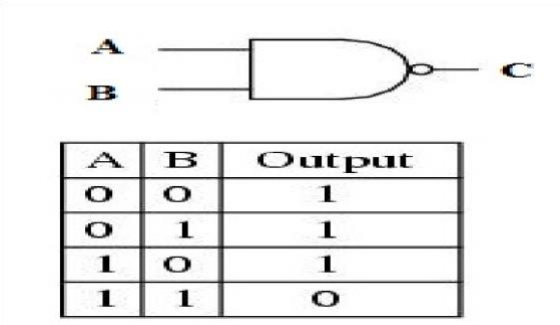


Figure 1 : 7400 IC

Each NAND gate has input pins and 1 output pin. The following chart shows NAND gate logic, which shows what output a NAND gate chip will produce for a set of given inputs.



A	B	Output
0	0	1
0	1	1
1	0	1
1	1	0

Figure 2 : NAND Gate Truth Table

2.2 Components

The components needed for this project are.

- Breadboard.
- 7400 NAND gate.
- 330 ohm resistor.
- 6.8 k.ohm resistor.
- Photo-resistor.
- 5mm LED.
- 9V battery.
- Some connection wires.

2.3 Simulation Environment/ Simulation Procedure

The full circuit in tinkercad has been shown below

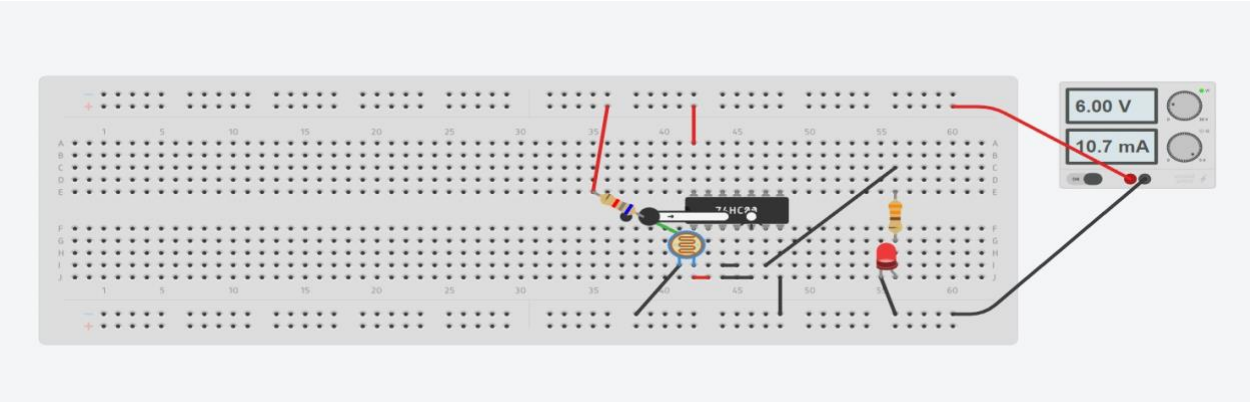


Figure 3 : Implementation on Tinkercad

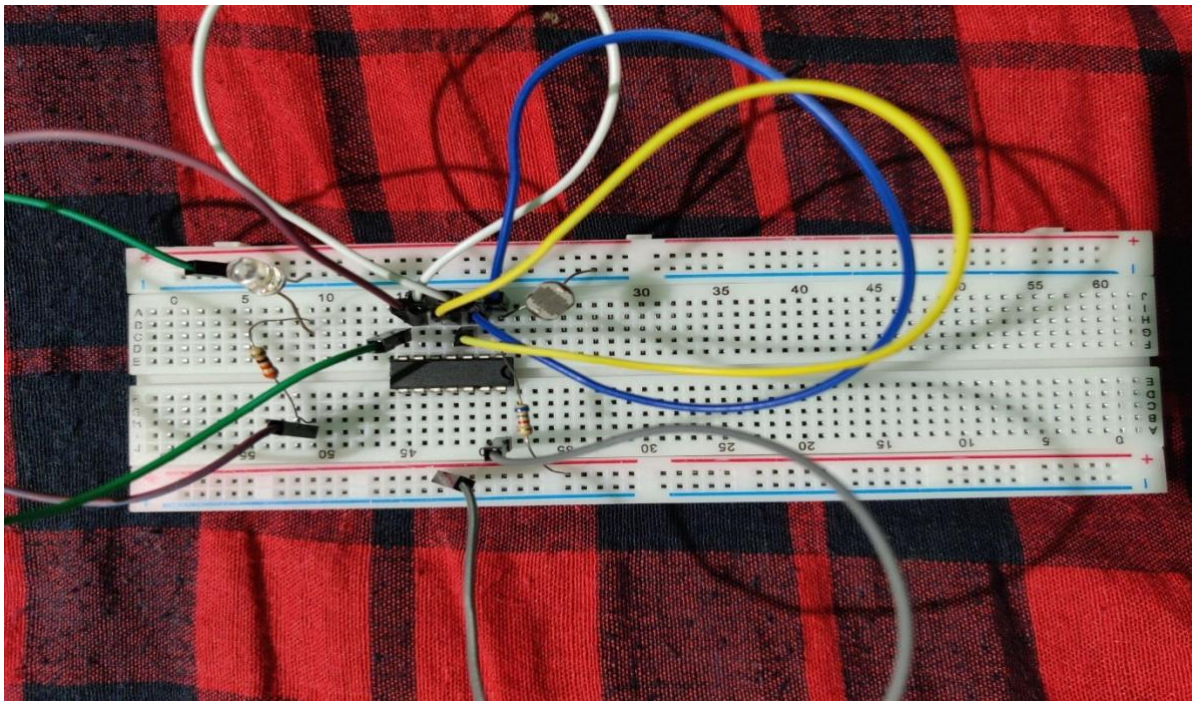


Figure 4 : Implementation on Physically

First and foremost, we must give power to the 7400 NAND gate chip. We will feed it 9V of power, so we give +9V to pin 14 and we connect pin 7 to GND. This establishes power to the chip.

When a photo-resistor is exposed to either room lighting or bright, it offers very low resistance. With this lighting condition, the resistance it offers will be lower than the 6.8KΩ of resistance that the fixed resistor offers. Therefore, most of the voltage in the voltage divider circuit will fall across the fixed resistor rather than the photo-resistor. With more than half of the supply voltage falling across the fixed resistor and this junction being connected to the inputs of the NAND gate, a logic level of HIGH (or 1) will be interpreted by the NAND gate. Since the inputs are tied together, they will be both be logic 1s, so the output will be LOW (or 0). Therefore, with bright lighting, the LED will not be powered on.

However, when the photo-resistor is exposed to darkness, it has very high resistance, in the order of a few megohms (MΩ). With resistance this high, most of the voltage from the power supply falls across the photo-resistor, with very little voltage falling across the 6.8KΩ fixed resistor. Thus, when connected to the inputs of NAND gate, with voltage so low, the NAND gate will essentially interpret the voltage divider as if it were LOW (or 0). so it will output a logic value of 1 (or HIGH), which means the output will be drawn up to VCC and the load, the LED, will be powered on.

3.1 Results and Discussions

Analysis and Outcome:

So you can see how this voltage divider circuit allows us to get 2 different logic levels produced by the NAND gate chip in different lighting conditions. NAND gate logic, two 1s gives a 0. This is the only time we get an output value of 0 in NAND gate logic. If a 0 is present anywhere in the inputs, including twice, the NAND gate will output a 1.