WATER LEVEL INDICATOR

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WATER LEVEL INDICATOR

REAL TIME PROJECT REPORT

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

BACHELOR OF TECHNOLOGY

IN

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BY

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CERTIFICATE

Date: /07/2024

This is to certify that the project work entitled ***WATER LEVEL INDICATOR*** *is a Bonafide work carried out by* ***SYED NOMAN HUSSAIN, K. MAHESH, B. SRI VARSHITA, V. MANIKANTA, E. SANJAY*** *and* ***V. ASHISH*** *bearing Roll Nos.* ***22RS1A0447****,* ***23RS5A0408*** ***22RS1A0408, 22RS1A0451, 22RS1A0415*** *and* ***23RS5A0415*** *in partial fulfillment of the requirements for the degree of* ***BACHELOR OF TECHNOLOGY*** *in* ***ELECTRONICS & COMMUNICATION ENGINEERING*** *by the Jawaharlal Nehru Technological University Hyderabad during the academic year 2023-24.*

The results embodied in this report have not been submitted to any other University or Institution for the award of any degree or diploma.

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Dr. Dhiraj Sunehra	**Mr. B. Ravi Kumar**
Professor	**Assistant Professor (C)**
Project Guide	**Project Guide**

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ABSTRACT

The effective management and monitoring of water resources is a crucial aspect of modern society, as it ensures the efficient utilization and conservation of this vital resource. One of the key components in this endeavor is the water level indicator, a device that provides real-time information about the water levels in various systems, from household tanks to large-scale reservoirs. The water level indicator using the BC 547 transistor is a simple, cost-effective, and reliable solution that addresses this need.

The BC 547 transistor, a widely used semiconductor device, serves as the foundation for this water level indicator. By leveraging the basic properties of the transistor, the device is able to detect changes in water levels and provide a clear visual indication to the user. This approach not only ensures accurate monitoring but also offers a level of robustness and durability that is essential for water management applications. The simplicity of the circuit design allows for easy integration into a wide range of water systems, making it a versatile solution that can be tailored to meet the specific requirements of various industries and applications.

The water level indicator using the BC 547 transistor has proven to be a highly effective and practical solution for monitoring water levels in various applications. The circuit can accurately detect and indicate different water levels, providing real-time feedback and early overflow detection through a buzzer alarm.

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Chapter 1
Introduction

1.1 Introduction

The water level indicator project using the BC 547 transistor is a simple and effective solution for monitoring water levels in various applications, such as tanks, reservoirs, or even sump pumps. This device utilizes the switching capabilities of the BC 547 transistor to detect changes in water levels and provide a visual indication, making it a useful tool for ensuring efficient water management and preventing potential issues like overflow or dry-running.

1.2 Aim of the Project

The aim of this project is to monitor water levels in tanks or reservoirs, providing vital information for efficient water management. The objectives of the project are as follows:

1. Develop a working circuit design for the water level indicator using the BC547 transistor.
2. Gain practical knowledge about the operation and characteristics of the BC547 transistor.
3. Learn to troubleshoot common issues encountered during the construction and testing phases..

1.3 Methodology

The project is aimed at the implementation of a Water Level Indicator using BC 547 transistor detects water levels by connecting the transistor bases to probes at different heights in the tank. As the water level rises, it connects successive bases to ground, turning on transistors that light LEDs to indicate the level. The final transistor triggers a buzzer when the tank is full.

1.4 Significance of the work

In this project we attempt to develop a device which can be used to monitor water levels. It has the following advantages:

- Efficient
- Cost-effective
- Less power consumption

- Customizable
- Visible and audible alerts

1.5 Organization of the thesis

This thesis is divided into five chapters including introduction and conclusions. The block diagram, features, pin diagram and other functional units of Arduino UNO are explained in Chapter 2. The description of various hardware components used in the project is explained in chapter 3. The schematic diagram, flowchart, experimental setup and results are discussed in chapter 5.

Chapter 2
Hardware Description

2.1 Introduction

The water level indicator circuit presented in this report utilizes the BC547 transistor to detect and display different water levels in a tank or container. The circuit is designed to provide a simple and reliable solution for monitoring water levels. By using an exposed wire with its end not insulated, the circuit can detect when the water level reaches the position of the wire, and indicate this visually through LED lights. The use of the BC547 transistor allows the circuit to amplify the small current changes triggered by the water contacting the exposed wire, activating the corresponding LED. This project demonstrates a practical application of basic transistor switching principles to create an effective water level monitoring system.

2.2 Circuit Diagram

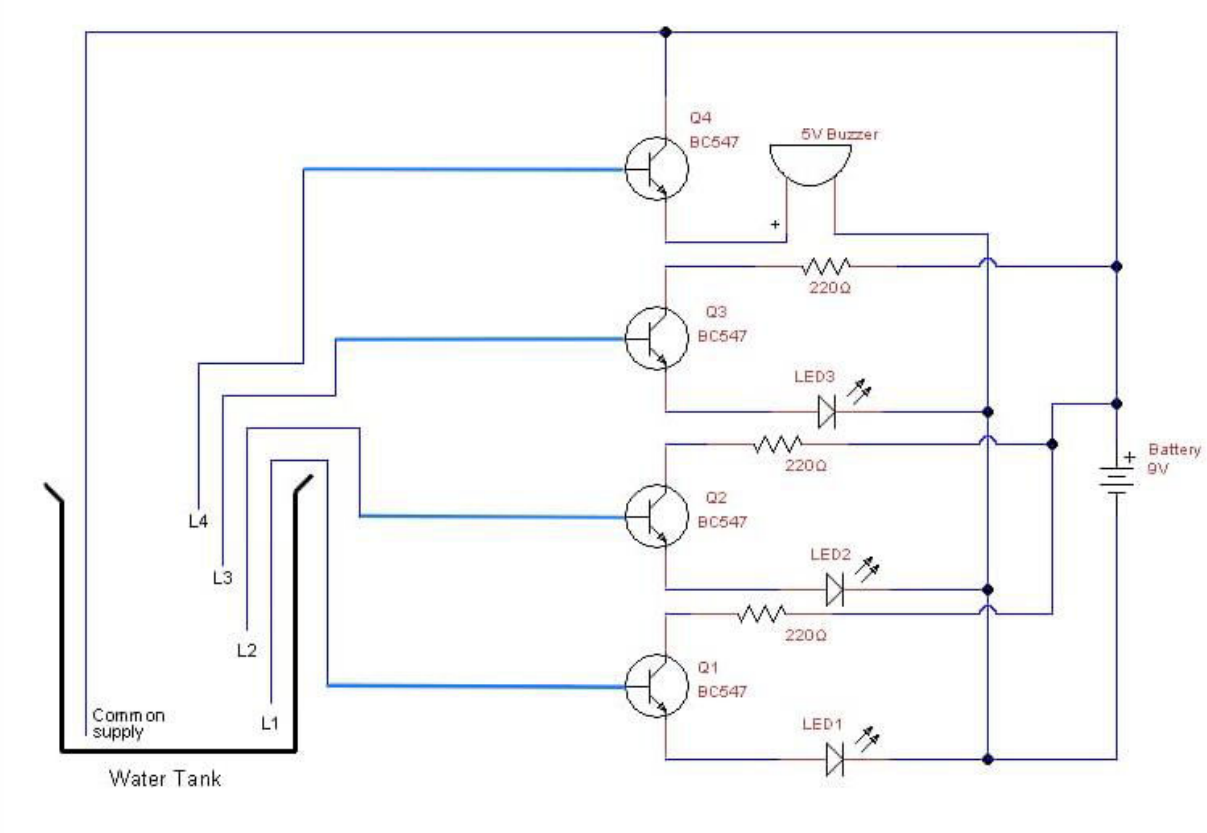

Fig 2.1: Circuit Diagram of the Project

2.3 Transistor (BC547)

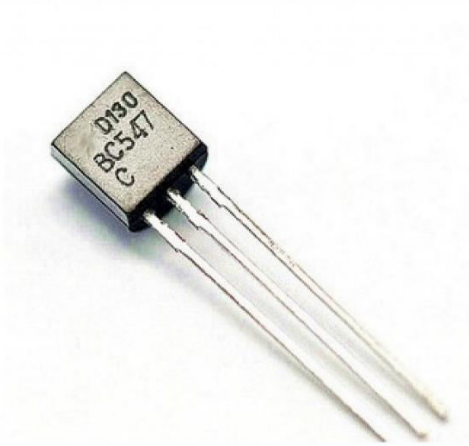

Fig 2.2: Transistor (BC547)

2.3.1 Features of BC547

1. High DC current gain (hFE) of up to 800, which determines its amplification capacity.
2. Low collector-emitter saturation voltage (VCE(sat)) of typically 200 mV, allowing efficient switching.
3. Maximum collector current (IC) of 100 mA, limiting the loads it can drive.
4. Base-emitter voltage (VBE) of around 900 mV in saturation mode.
5. Compact TO-92 package suitable for through-hole mounting in various electronic circuits.

2.3.2 Description

The BC 547 is a general-purpose NPN bipolar junction transistor. It is commonly used for switching and amplification applications. With a maximum current of 100mA and a voltage rating of 45V, it is ideal for low-power electronic circuits. Its compact size and reliability make it popular in hobbyist and professional projects.

2.3.3 Pin Diagram

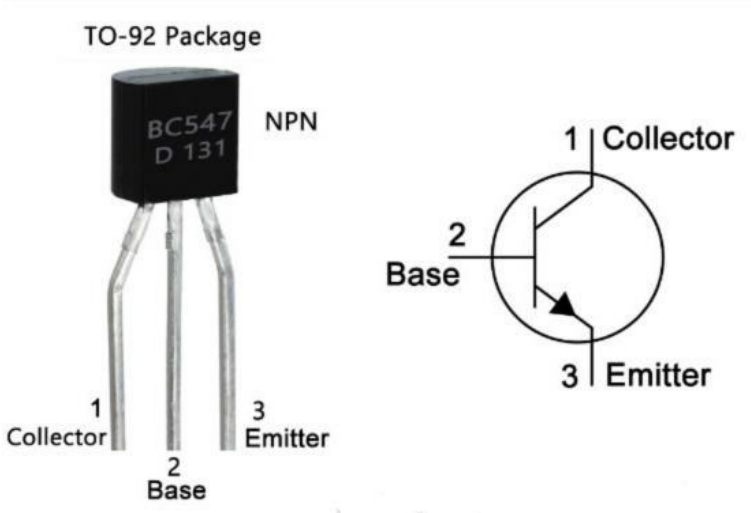

Fig 2.3: Pin Diagram of BC547

1) **Collector :**

The collector terminal is responsible for collecting the majority charge carriers (electrons in the case of an NPN transistor like the BC547) that are emitted from the emitter terminal. The amount of current that flows through the collector terminal is controlled by the voltage applied to the base terminal.

In the forward bias mode of operation, the collector-emitter voltage is typically around 0.2V, allowing current to flow from the collector to the emitter. In the reverse bias mode, the collector-emitter voltage is much higher, effectively cutting off the flow of current.

2) **Base :**

The base terminal acts as the control electrode for the transistor. The voltage applied to the base determines the amount of current that flows from the collector to the emitter. In an NPN transistor like the BC547, a small current flowing into the base terminal can control a much larger current flowing from the collector to the emitter.

The base-emitter voltage of the BC547 is typically around 0.6-0.7V when the transistor is in forward active mode.

3) **Emitter :**

The emitter terminal is the source of the majority charge carriers (electrons in the case of an NPN transistor like the BC547) that flow through the transistor.The emitter-base junction is forward biased, allowing electrons to be injected from the emitter into the base region.

The emitter-base voltage (VBE) of the BC547 is typically around 0.6-0.7V when the transistor is in forward active mode.

2.4 Light Emitting Diode

Fig 2.4: Light Emitting Diode

2.4.1 Features

1. LEDs are capable of rapid on/off switching, allowing them to be used for high-speed data transmission in fiber optic communications.
2. LEDs are highly energy-efficient, converting up to 50% of input energy into light compared to just 10% for incandescent bulbs.
3. LEDs have a long lifespan, with some models rated for over 50,000 hours of use.
4. LEDs are available in a wide range of colors, including red, green, blue, and white, by using different semiconductor materials.
5. LEDs are compact and durable, making them suitable for use in a variety of applications from indicator lights to high-power illumination.

3.4.2 Description

A light-emitting diode (LED) is a semiconductor device that emits light when an electric current passes through it. When electrons in the semiconductor material recombine with electron holes, they release energy in the form of photons, which we perceive as light.

LEDs operate at low voltages, typically between 1 and 3 volts, and can be powered directly from batteries or low-voltage power supplies. This makes them suitable for a variety of applications, from indicator lights to high-power illumination.

3.4.3 Pin Diagram

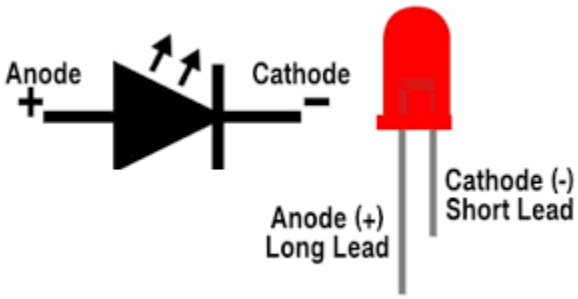

Fig 2.5: Pin Diagram of LED

2.5 Buzzer

Fig 2.6: Buzzer

2.5.1 Features

1. Produces audible tones when an electrical signal is applied, typically used for alarms, timers, and user input confirmation.

2. Available in active (rings as long as energized) and passive (requires a signal to produce sound) variants.
3. Compact size suitable for integration into electronic circuits and projects.
4. Operates on low voltages like 3.3V to 5V DC.
5. Durable construction using high-quality materials for long-lasting performance.

2.5.2 Description

An electronic buzzer is a device that produces a loud, attention-grabbing sound when activated. It is commonly used in various applications, such as alarms, doorbells, timers, and electronic devices, to alert users or indicate specific events. The buzzer's sound is generated by an oscillating electric current that vibrates a diaphragm, creating the distinctive buzzing noise.

2.5.3 Pin Diagram

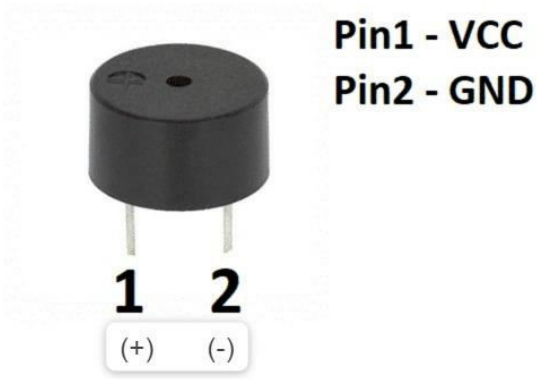

Fig 2.7: Pin Diagram of Buzzer

2.6 Resistor

Fig 2.8: Resistor (220 Ω)

2.6.1 Description

Resistors are passive electronic components used to limit current flow, adjust signal levels and divide voltages. It is measured in ohms (Ω).

Resistors are made from materials such as carbon, metal, or metal oxide, with leads attached for circuit connection. In this project 220 Ω resistor is used.

2.7 Breadboard

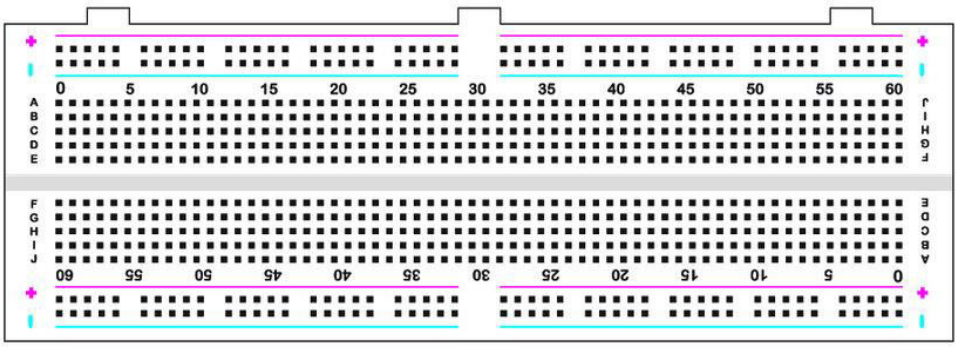

Fig 2.9: Breadboard

2.7.1 Features

1. **Reusability -** Breadboards allow for easy and quick creation of temporary electronic circuits without the need for soldering, making them reusable.
2. **Ease of Prototyping -** Breadboards enable developers to easily build and test circuits by simply inserting components into the pre-drilled holes, allowing for quick prototyping.
3. **Versatility -** Breadboards come in different sizes and shapes to accommodate a variety of circuit designs, and can be connected together to create larger prototyping surfaces.
4. **Accessibility -** Breadboards are economical and do not require specialized tools or parts, making them accessible for hobbyists, students, and engineers**.**
5. **Modularity -** Components can be easily added, removed, or rearranged on a breadboard, allowing for quick modifications to the circuit design**.**

2.7.2 Description

A breadboard is a construction base used for prototyping electronic circuits. It allows electronic components to be easily connected and tested without the need for soldering. Breadboards have a grid of interconnected holes that accept the leads of electronic components, making it a versatile tool for circuit design and experimentation. The components can be quickly inserted and rearranged, enabling rapid prototyping and testing of circuits. Breadboards are commonly used in electronics education, hobbyist projects, and early-stage product development, as they provide a convenient and reusable platform for building and experimenting with electronic circuits.

2.8 Conclusions

In this chapter different hardware components involved in the project are discussed and their interfacing is explained.

Chapter 3

Results and Discussion

3.1 Introduction

In this chapter we discuss the project outputs and results of the project.

3.2 Schematic diagram

Figure 3.1 shows the schematic diagram of the project

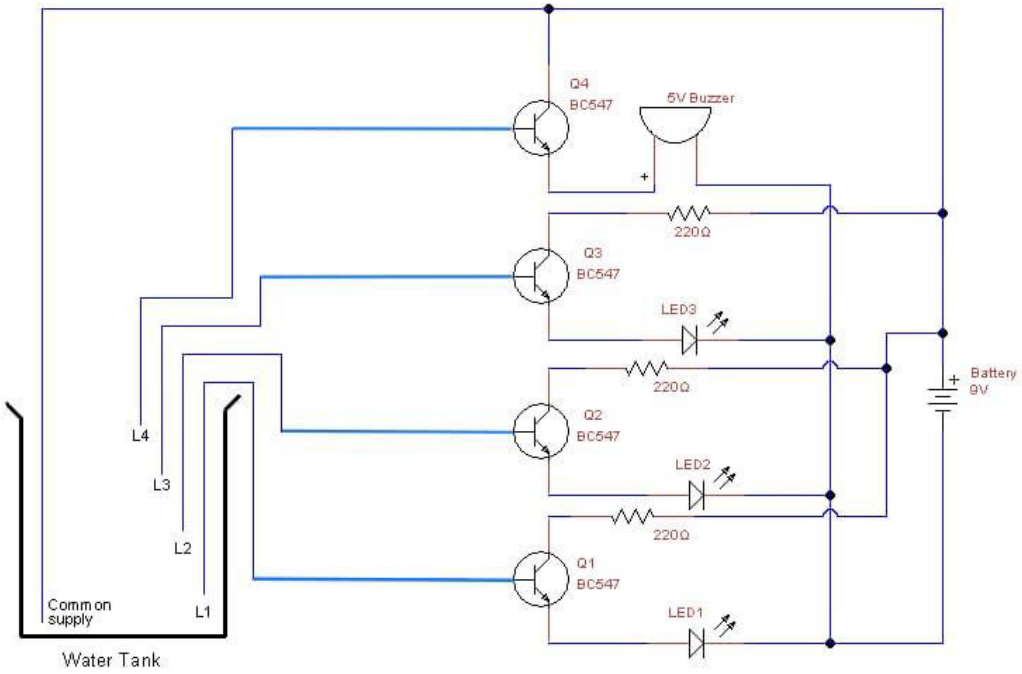

Fig 3.1: Schematic diagram of the project

3.3 Experimental Setup

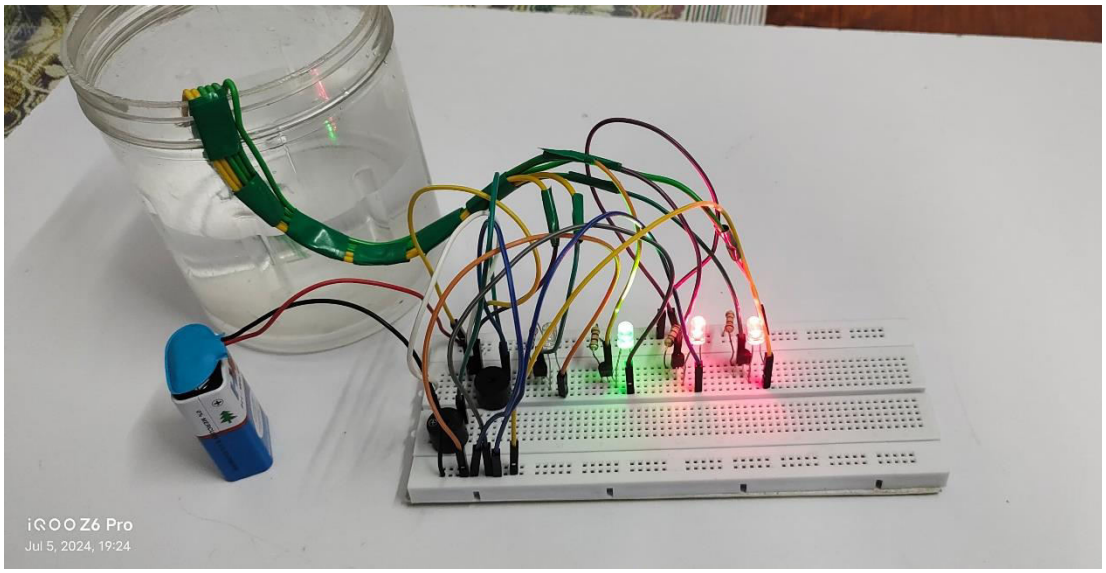

Fig 3.2: Experimental Setup

3.4 Results

The following figures show the results obtained during this project.

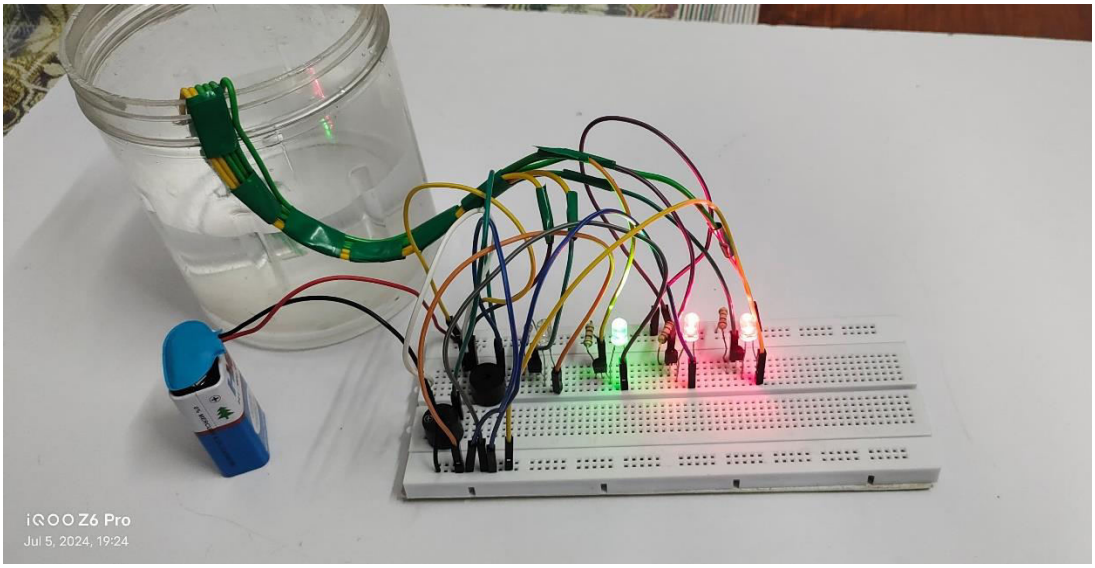

Fig 3.3: Water Level Indicated at 60%

3.5 Conclusions

In this chapter we have seen the schematic diagram, experimental setup of the project and their results during various operations.

Chapter 4

Conclusions

The water level indicator using the BC 547 transistor is a simple and effective project that can be used to monitor the water level in various applications, such as water tanks, reservoirs, and even swimming pools. This project utilizes the basic properties of a transistor to detect the presence of water and provide a visual or audible indication of the water level.

By connecting the transistor to a series of LEDs, the project can display the current water level, allowing the user to easily monitor and maintain the desired water level. The project is easy to construct, cost-effective, and can be customized to suit specific needs. Overall, this water level indicator project is a practical and useful application of basic electronics principles, making it a great learning experience.