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Sinhgad College of Engineering, Pune

Department of E&TC

T. E. E&TC - (Mini – Project)

Group No: A35

Automatic Plant Irrigation System Using PIC

By

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Abstract

Utilizing PIC controller technology, this abstract presents an automatic plant irrigation system designed to optimize water usage and enhance plant growth. The system integrates sensors to monitor soil moisture levels, triggering irrigation cycles when levels drop below a predefined threshold. Employing PIC microcontrollers enables precise control and efficient operation, ensuring timely water delivery to plants. Through real-time data processing and automation, the system minimizes manual intervention, conserves water resources, and fosters healthier plant growth. This abstract outlines the design, functionality, and benefits of the automatic plant irrigation system, emphasizing its potential for sustainable agriculture and environmental conservation.

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Introduction

- Irrigation is the artificial application of water to the land or soil.
- It is used to assist in the growing of agricultural crops, maintenance of landscapes and revegetation of distrubed soils in dry areas and during periods of inadequate rainfall.
- Our project focuses on automating the irrigation process, enhancing efficiency, and conserving water resources.
- Its purpose lies in optimizing agricultural productivity while conserving water resources through efficient irrigation management.
- Automation is central, reducing manual intervention and enhancing operational efficiency.

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Litreture Survey

- The literature survey of Automatic Plant Irrigation Systems utilizing PIC controller technology highlights significant advancements and insights in agricultural automation. Studies such as (insert reference) have demonstrated the efficacy of integrating PIC microcontrollers to regulate irrigation, optimizing water usage and enhancing crop yield. (Insert reference) underscores the importance of sensor integration, particularly soil moisture sensors, in providing accurate data for timely irrigation decisions.
- Other research, such as (insert reference), explores the role of automation in reducing manual labor and improving operational efficiency in agriculture. Furthermore, studies like (insert reference) emphasize the customizable nature of these systems, allowing farmers to tailor irrigation schedules to specific crop requirements. Challenges such as power efficiency and system reliability are addressed in works like (insert reference), proposing innovative solutions to ensure the robust performance of automatic irrigation systems.

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Aim and Objectives

- **Aim :** To create a Automatic Plant Irrigation System Using PIC Microcontroller.

- **Objectives:**

- The system's main aim is to provide the amount of irrigation to agricultural fields by observing the moisture content of soil.
- The project minimizes the manual process if irrgating the field by switch the pump ON/OFF.
- The system works with the use of PIC microcontroller, which collects the input signals that measures moisture content of soil through sensing arrangement.
- This system helps in reducing the manual work and provides required irrigation to the agricultural feild.

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Block Diagram

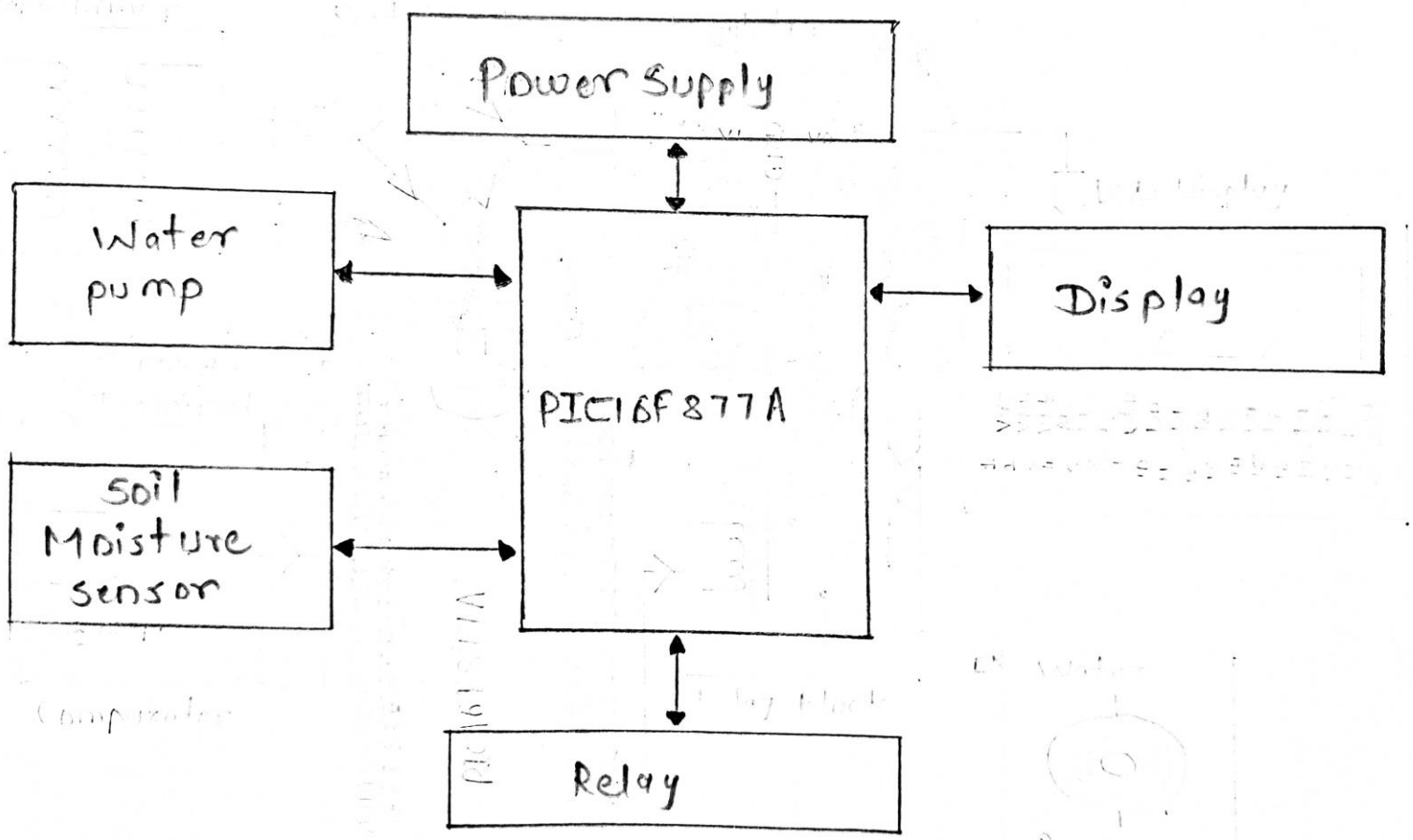

Fig 1: Block Diagram

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Circuit Diagram

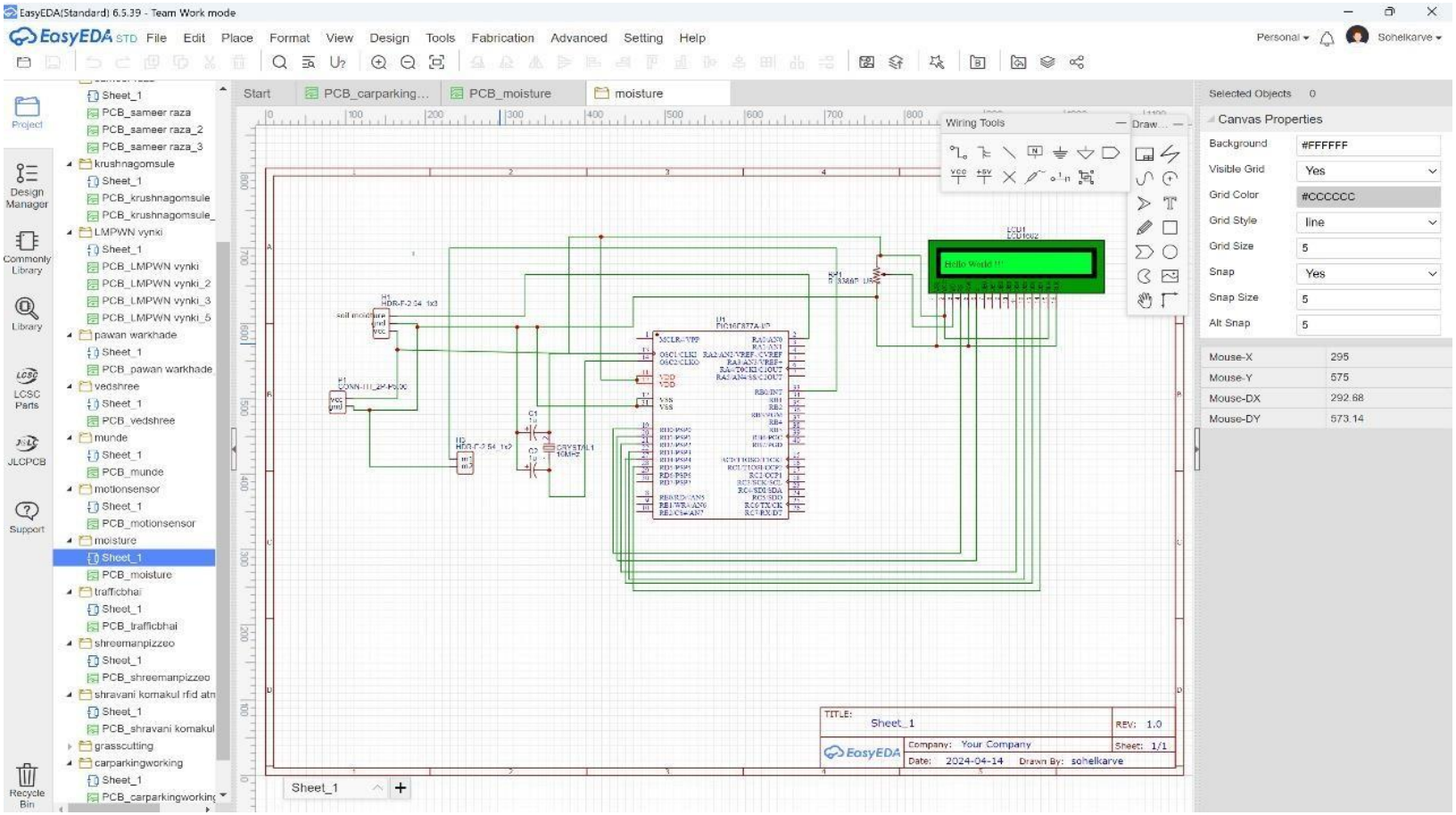

Fig 2 : Simulation

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Components

1. PIC 16F877A
2. Soil Moisture Sensor
3. 5V DC Relay Module
4. 3-6V Water Pump
5. 5V Power Supply
6. Resistor,Capacitor Connectin Wires
7. LED
8. Diodes
9. LCD Displays

PIC 16F877A

PIC 16F877A: The PIC 16F877A is a versatile microcontroller suitable for a wide range of embedded applications, from simple LED blinking projects to complex control systems. Its rich set of features and peripherals make it a popular choice among hobbyists, students, and professional embedded system designers.

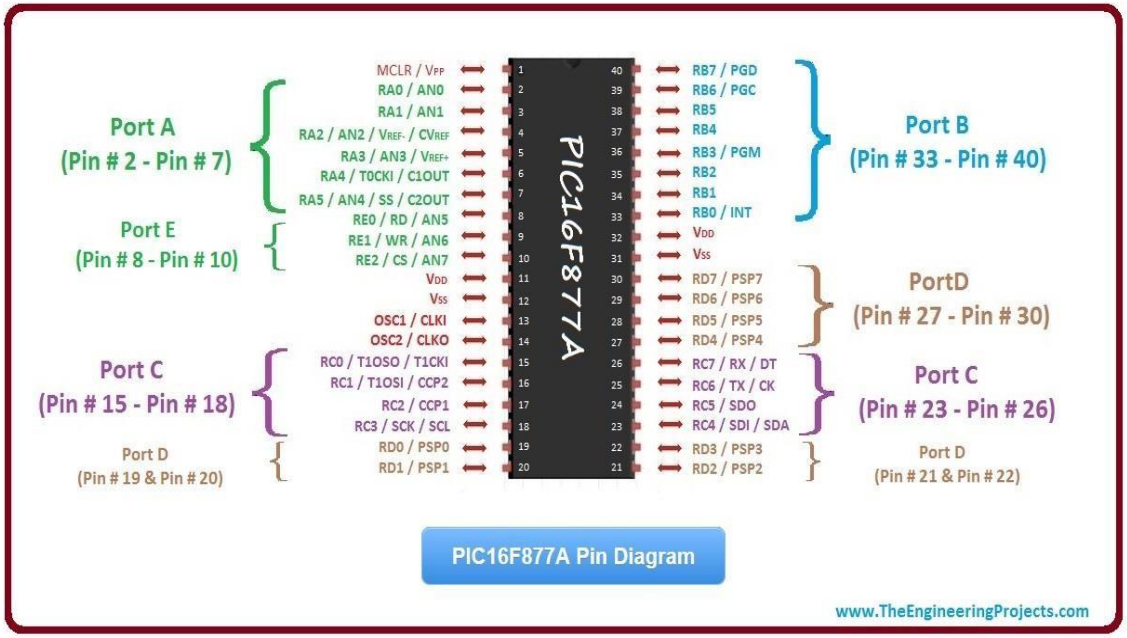

Fig 3: PIC 16F877A

Soil moisture sensor

Soil moisture sensor : It measures the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

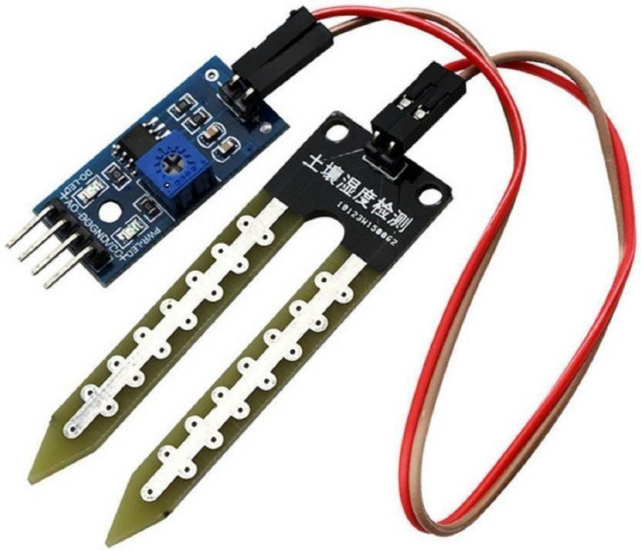

Fig 4: Soil moisture sensor

Motor Pump:

Motor Pump : A DC motor pump is essentially a DC Motor that is used to circulate water. Theinternal structure is the same. The DC motor is encased in a waterproof plastic casing and the shaft is used to drive an external arm that pumps water.The Pump requires a 5V supply, which can be easily provided by batteries or AC supply.

Fig 5: Motor Pump

16x2 LCD & Relay

16x2 LCD: The LCD (Liquid Crystal Display) 16-2 is a common type of alphanumeric display module consisting of 16 columns and 2 rows of characters.

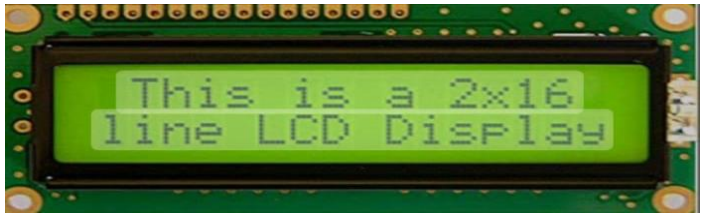

Fig 6: 16x2 LCD

Relay: A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit

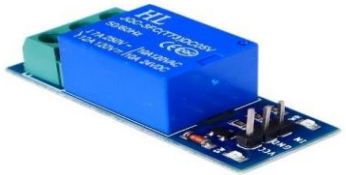

Fig 7: Relay

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PCB Layout

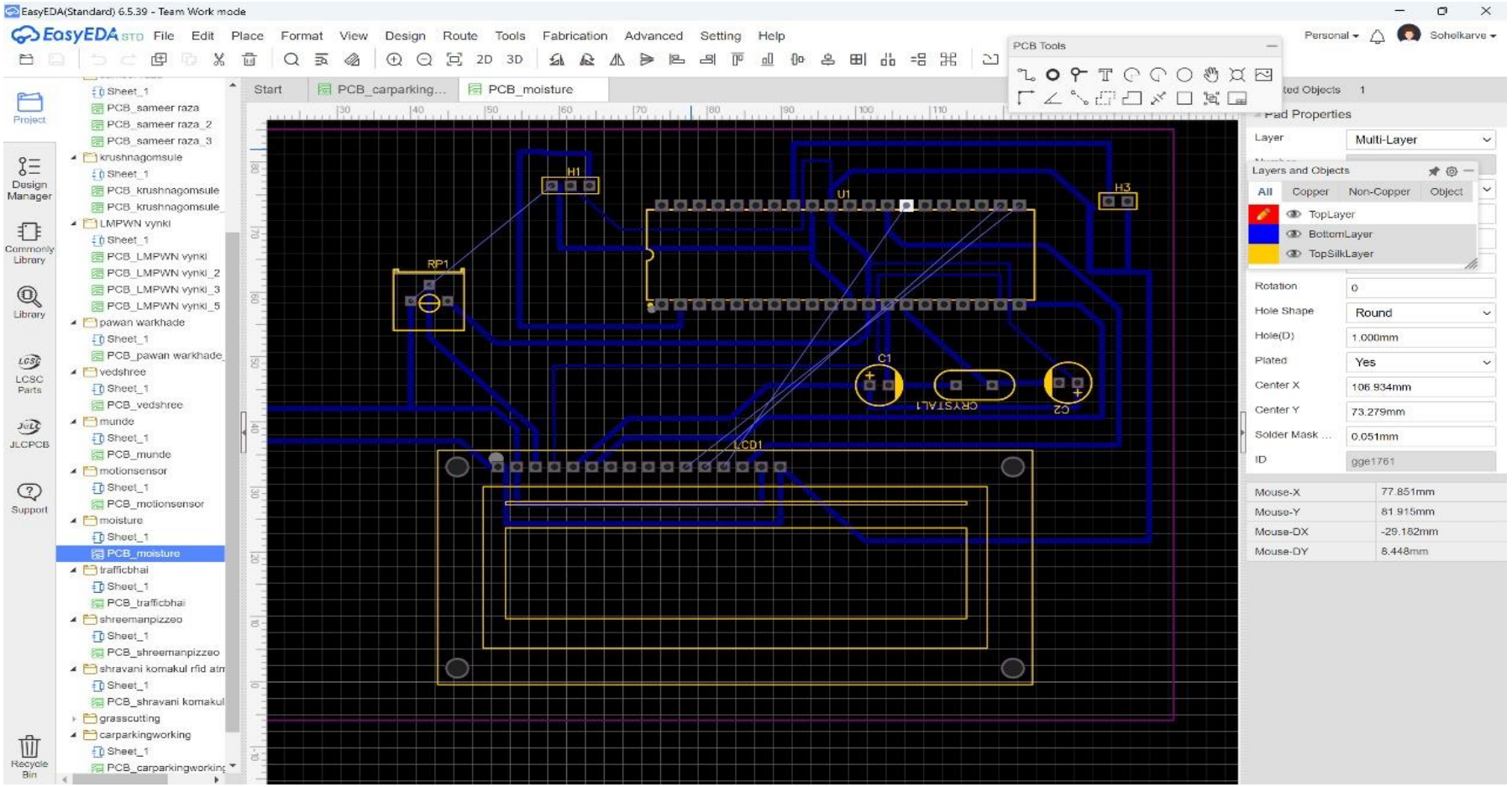

Fig 8 : PCB Layout

Flowchart

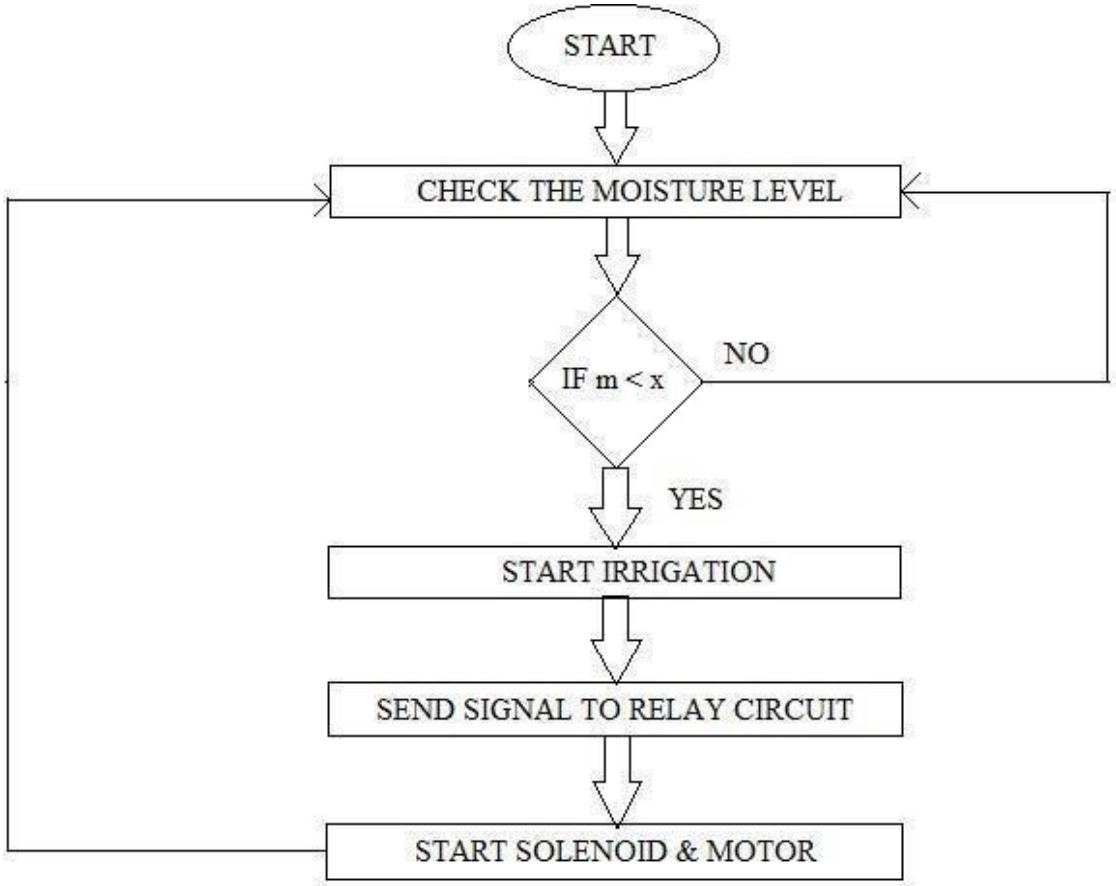

Fig 9 : Flowchart

Result

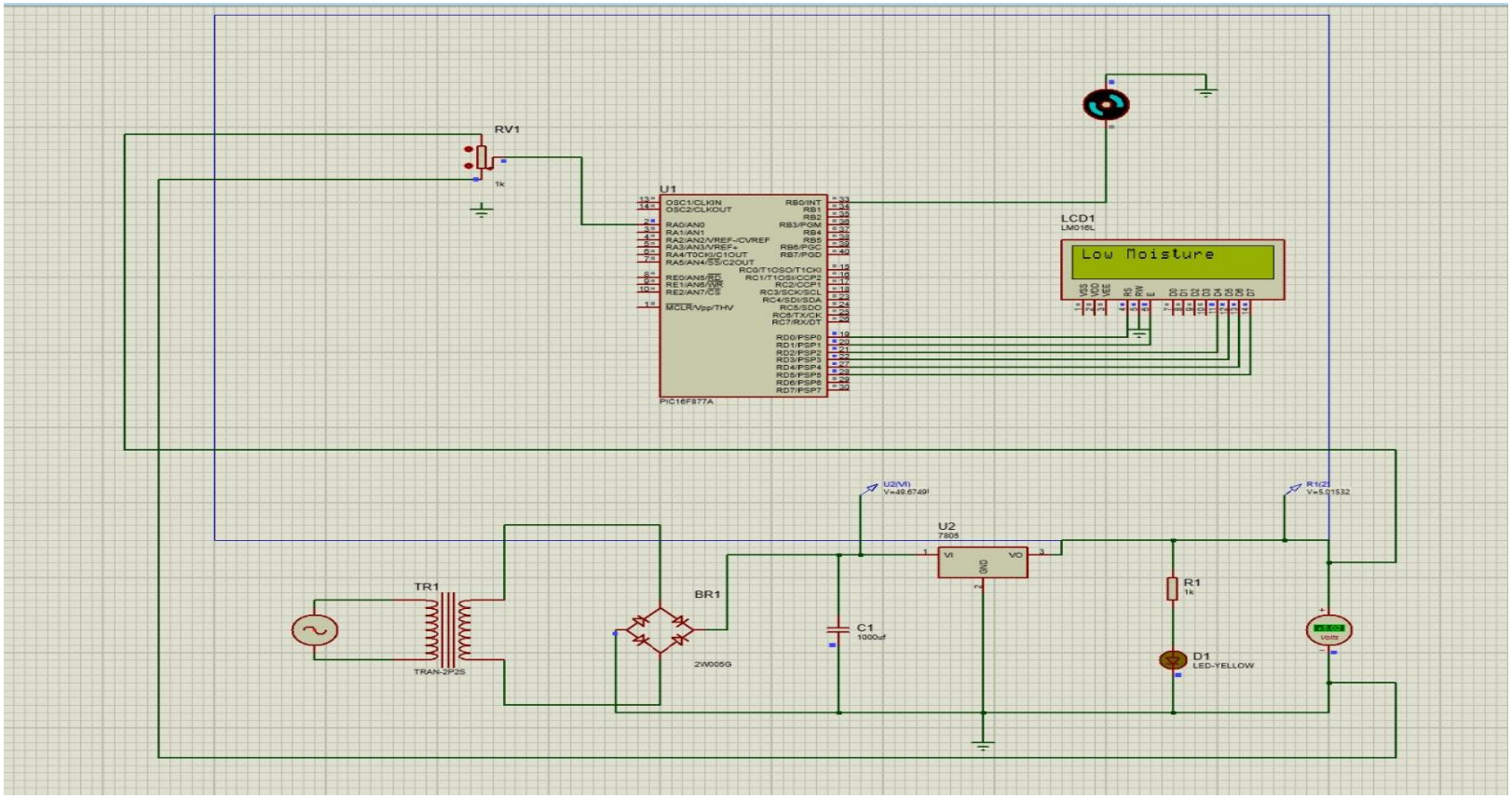

Fig 10 : Simulation Results

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Results

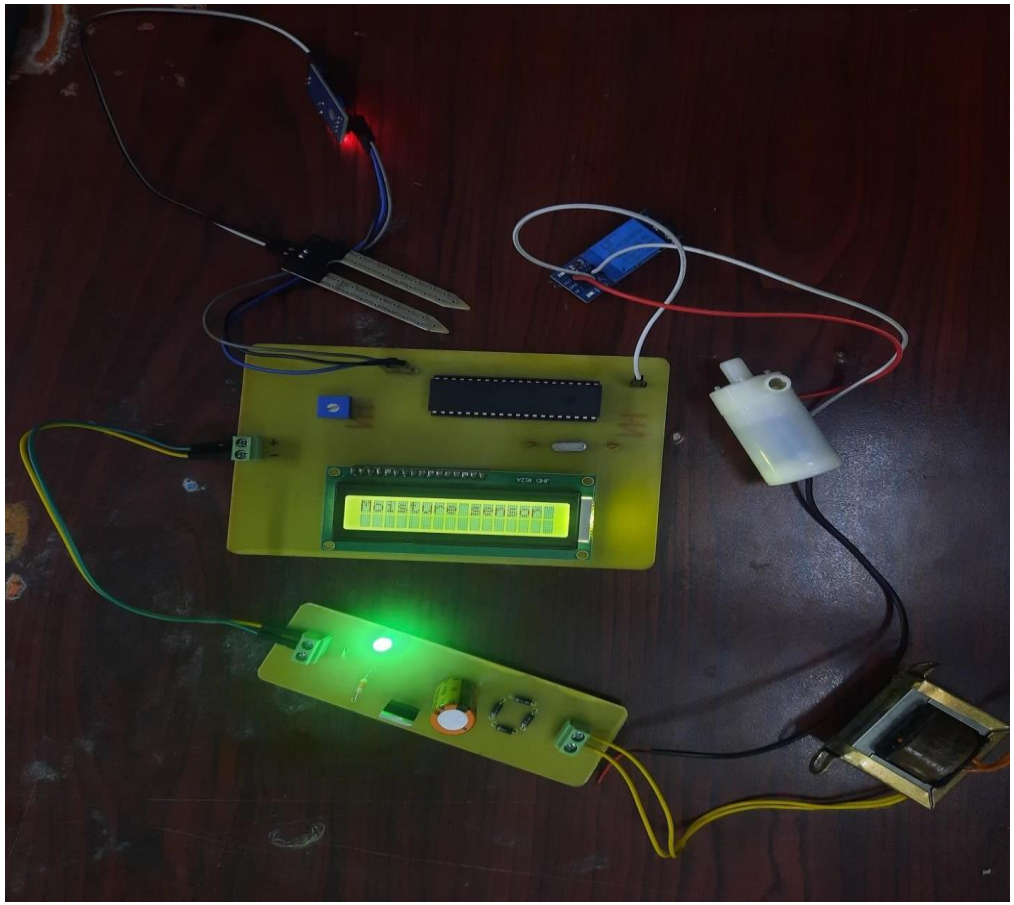

Fig 11 : Results

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Applications And Limitations

Applications :

- Home gardening automation.
- Minimizes water waste and improves plant growth.
- Greenhouse irrigation control.
- Urban vertical farming systems.
- Agricultural field moisture management.
- Indoor plant watering automation.

Limitations :

- Susceptibility to sensor malfunctions,
- Reliance on power supply,
- Potential complexity

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Conclusion

In present days especially farmers are facing major problems in watering their agriculture fields, it's because they have no proper idea about when the power is available so that they can pump water. Even after then they need to wait until the field is properly watered, which makes them to stop doing other activities. Here is an idea which helps not only farmers even for watering the gardens also, which senses the soil moisture and switches the pump automatically when the power is ON.

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Future Scope

The future of automatic plant irrigation systems with PIC controllers lies in integrating IoT, precision agriculture, data analytics, sustainable energy solutions, and scalable, modular designs for diverse crops and environments. PIC microcontrollers will efficiently process data to precisely regulate water delivery, optimizing resource usage and crop yields. Integration with IoT technology will enable remote monitoring and control via smartphones or computers, offering convenience and flexibility to farmers and home gardeners alike. With enhanced efficiency and sustainability, these systems will contribute to the development of smart, eco-friendly agriculture, ensuring healthier plants and bountiful harvests for a growing global population.

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Reference

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