AUTOMATED WATER PUMP CONTROLLER

AUTOMATIC ROOF SHED USING RELAY

20EC5203 - ELECTRONIC DESIGN PROJECT I

A PROJECTREPORT

Submitted by

SUDHARSANAN M

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

ELECTRONICS AND COMMUNICATION ENGINEERING

K. RAMAKRISHNAN COLLEGE OF TECHNOLOGY

(An Autonomous Institution, affiliated to Anna University Chennai and Approved by AICTE, New Delhi)

SAMAYAPURAM– 621 112

DECEMBER, 2024

AUTOMATED WATER PUMP CONTROLLER

AUTOMATIC ROOF SHED USING RELAY

20EC5203 - ELECTRONIC DESIGN PROJECT I

A PROJECTREPORT

Submitted by

SUDHARSANAN M

in partial fulfillment for the award of the degree

of

BACHELOROF ENGINEERING

in

ELECTRONICS AND COMMUNICATION ENGINEERING

K. RAMAKRISHNAN COLLEGE OF TECHNOLOGY

(An Autonomous Institution, affiliated to Anna University Chennai and Approved by AICTE, New Delhi)

SAMAYAPURAM– 621 112

DECEMBER, 2024

K.RAMAKRISHNAN COLLEGE OF TECHNOLOGY

(AUTONOMOUS)

SAMAYAPURAM,TIRUCHIRAPPALLI– 621 112

BONAFIDE CERTIFICATE

Certified that this project report titled "**AUTOMATED WATER PUMP CONTROLLER & AUTOMATIC ROOF SHED USING RELAY**" **is** the bonafide work of **SUDHARSANAN M(811722106114)** who carried out the project under my supervision. Certified further, that to the best of my knowledge the work reported here in does not frompart of any other project report or dissertation on the basis of which a degree or award wasconferred on an earlier occasion on this or any other candidate.

SIGNATURE

Dr.S.SYEDAKBAR M.E.,Ph.D.,

HEAD OF THE DEPARTMENT

Assistant Professor

Department of Electronics and

Communication Engineering

K.Ramakrishnan College of

Technology (Autonomous)

Samayapuram – 621 112

SIGNATURE

Dr.S.SYEDAKBAR M.E.,Ph.D.,

SUPERVISOR

Assistant Professor

Department of Electronics and

Communication Engineering

K.Ramakrishnan College of

Technology (Autonomous)

Samayapuram - 621 112

Submitted for the viva-voce examination held on ………………

INTERNAL EXAMINER **EXTERNALEXAMINER**

DECLARATION

I declare that the project report on "**AUTOMATED WATER PUMP CONTROLLER**" and"**AUTOMATIC ROOF SHED CONTROLLER**" is the result of original work done by me and best of my knowledge, similar work has not been submitted to "**ANNAUNIVERSITY CHENNAI**" for the requirement of Degree of **BACHELOR OF ENGINEERING.** This project report is submitted on the partial fulfillment of the requirement of the award of Degree of **BACHELOR OF ENGINEERING**.

Signature

M . SUDHARSANAN

Place:Samayapuram

Date:

LIST OF FIGURES

LIST OF ABBREVIATIONS

AC	-	Alternating Current
CH	-	Channel
DC	-	Direct Current
F	-	Farads
LED	-	Light Emitting Diode
IC	-	Integrated Circuit
IOT	-	Internet Of Things
SSR	-	Solid State Relay

CHAPTER 1

COMPONENTS

1.1 BREAD BOARD

A breadboard serves as an indispensable tool in the realm of electronics, providing versatile platform for the assembly and testing of electronic components. Fig 1.1 shows that the bread board with a grid of interconnected holes, the breadboard is designed to offer a user-friendly environment that facilitates the creation of electronic circuits without the need for soldering. The grid arrangement follows rows and columns, and within each row, multiple holes are electrically connected. Beneath the surface of the board, metal clips establish electrical connections, allowing for the creation of intricate circuits without the permanency associated with soldered connections.

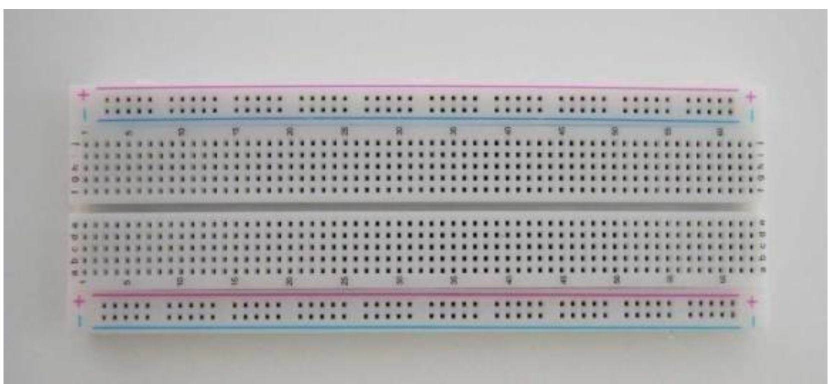

Figure 1.1 Bread board

In addition to its grid structure, breadboards typically feature power rails along the sides, commonly colored in red and blue. These power rails provide accessible points for connecting power sources, whether they be batteries or external power supplies. The ease of access to powerfacilitates the testing and experimentation of circuits. Connecting wires play a crucial role in establishing electrical connections between various components on the breadboard.

1.2 DIODE

A diode, a fundamental semiconductor device with two terminals known as the anode and cathode, plays a pivotal role in electronic circuits due to its unique electrical properties. Fig 1.2 indicates that, the primary function of a diode is to control the flow of electric current by allowing it in one direction while blocking it in the opposite direction. This property is vitalin rectification processes, especially in power supply circuits, where diodes are instrumentalin converting alternating current (AC) to direct current(DC). The behavior of a diode is characterized by its voltage-current relationship, described by the Shockley diode equation,which exhibits an exponential relationship between the voltage across the diode and the current flowing through it. When the diode is forward-biased, meaning a positive voltage isapplied to the anode with respect to the cathode, it conducts current, allowing the flow of electrons. In contrast, when the diode is reverse-biased (negative voltage applied to the anode), it blocks current, essentially acting as a one-way valve for electric current.

Figure 1.2 Diode

1.3 LED

Light Emitting Diodes (LEDs) represent a groundbreaking technology with wide-ranging applications across diverse industries. Fig 1.3 shows that the functioning of LED principle of electroluminescence, LEDs emit light as a result of electrons moving within a semiconductor material. The advantages of LEDs are manifold. They excel in energy efficiency by converting a significant portion of electrical energy into visible light, surpassing traditional incandescent bulbs that dissipate a substantial amount as heat.The durability of LEDs is a key asset, attributed to their solid-state construction, lacking delicatecomponents like filaments or glass bulbs.

Figure 1.3 LED

Beyond their use in indicators and displays, LEDs play a pivotal role in driving technological advancements. Their low power consumption makes them ideal for battery-operated devices, while their contribution to energy efficiency aligns with sustainability goals. In the automotive industry, LEDs are extensively used in headlights and taillights, improving visibility and safety. The continual evolution of LED technology underscores its importance in shaping a more sustainable and technologically advanced future. As research and development in this field progress, LEDs are likely to play an even more central role in addressing global energy challenges and fostering innovation across a myriad of applications.

1.4 POWER SUPPLY

A battery stands as a fundamental component in the realm of portable electronics, operating as a versatile electrochemical device designed to store and deliver electrical energy through a controlled chemical reaction.Fig 1.4 indicates that the battery composed of one or moreelectrochemical cells, a battery consists of positive (cathode) and negative (anode) electrodes immersed in an electrolyte solution. The chemical interaction between these components, when a circuit is closed, triggers a reaction that results in the flow of electrons,generating electrical energy. Nickel-cadmium batteries, also rechargeable, find their nichein portable electronics, offering a balance between efficiency and longevity. Alkaline batteries are ideal for low-drain devices, while lithium-ion batteries shine in applications demanding compactness and high energy storage.

Figure 1.4 Battery

Rechargeable batteries, a notable category, contribute significantly to sustainability efforts by minimizing waste and promoting resource efficiency. Particularly economical for devices with frequent usage patterns, rechargeable batteries not only reduce environmentalimpact but also prove cost-effective over time. Batteries serve as omnipresent power sources, indispensable for a broad spectrum of electronic devices. Their role extends frompowering small everyday gadgets to being the driving force behind electric vehicles. In anera where electronic devices are integrate daily life.

1.5 RESISTOR

A resistor is a fundamental electronic component that opposes the flow of electric current.Fig 1.5 indicates that the resistor two-terminal device with the primary function of controlling or limiting the amount of current passing through a circuit. Resistors are crucial in electronicsfor adjusting voltage levels, protecting components from excessive currents, and defining time constants in various applications. Resistors come in various types, including fixed resistors with specific resistance values and variable resistors like potentiometers and rheostats that allow manual adjustment. The resistance of a resistor is measured in ohms (Ω) and is governed by Ohm's Law,which relates the voltage (V), current (I), and resistance

(R) in a circuit through the equation $V = I \times R$. In electronic circuits, resistors play essentialroles in voltage dividers, signal conditioning, and setting bias points for active devices liketransistors.

Figure 1.5 Resistor

Moreover, in setting bias points for active devices like transistors, resistors contribute to stabilizing and controlling the operation of these components. They are also employed in filters, oscillators, and numerous other applications where precise control of electricalparameters is necessary.

1.6 CAPACITOR

A capacitor is a fundamental electronic component that stores and releases electrical energy in a circuit.Fig 1.6 indicates that the two conductive plates separated by an insulatingmaterial called a dielectric. When a voltage is applied across the plates, an electric field is established, causing the accumulation of positive and negative charges on the respective plates. Capacitors are versatile components with various applications in electronics. They play a crucial role in smoothing voltage fluctuations, filtering signals, and providing energystorage in circuits. The ability to store electrical energy temporarily makes capacitors valuable in timing circuits, coupling AC and DC signals, and decoupling power supplies. Capacitors come in different types, including electrolytic capacitors, ceramic capacitors, and tantalum capacitors, each with specific properties suited to different applications. Thecapacitance of a capacitor, measured in farads (F), indicates its ability to store charge.

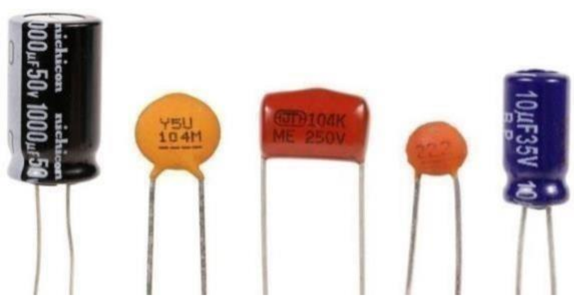

Figure 1.6 Capacitor

In electronic circuits, capacitors are essential for stabilizing power supplies, eliminating noise, and facilitating the proper functioning of various electronic components. They playintegral roles in audio systems, power amplifiers, filters, and numerous other electronic devices, contributing significantly to the efficiency.

1.7 INTEGRATED CIRCUIT

An Integrated Circuit (IC) is a compact arrangement of interconnectedelectronic components, such as transistors, resistors, capacitors, and diodes, fabricated on a semiconductor material. Fig 1.7 shows that the miniaturized design of an IC allows for the integration of multiple functions and electronic circuits into a single chip, providing a significant advancement in electronic technology. Digital ICs, such as microprocessors and memory chips, process binary information, enabling the operation of computers and digital devices.Analog ICs, like operational amplifiers (op-amps) and voltage regulators, are designed forcontinuous signal processing, common in audio amplifiers and power supplies. The 555 timer IC and the 741 op- amp are notable examples.

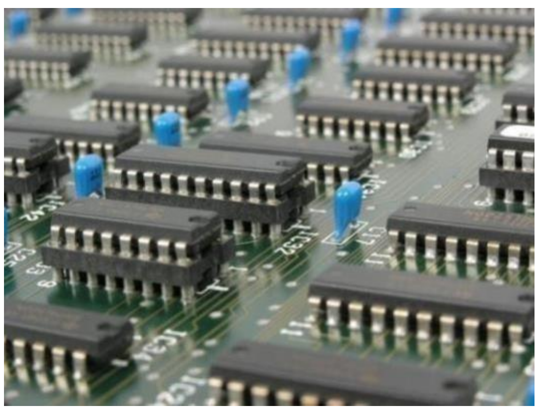

Figure 1.7 Integrated Circuit

The compact nature of ICs enables the creation of complex electronic systems while minimizing space requirements, power consumption, and manufacturing costs.Integrated Circuits have revolutionized the field of electronics, contributing to the development of countless electronic devices, from computers a smartphones.

1.8 CONNECTING WIRES

Connecting wires form the indispensable infrastructure of electronic circuits, serving as the vital conduits that establish electrical pathways and facilitate the seamless flow of electric current.Fig 1.8 indicates that the wires, typically composed of conductive materials like copper or aluminum, play a fundamental role in ensuring the proper functioning of circuits, both on breadboards and within complex electronic systems.The primary function of connectingwires is to link various components within a circuit, creating the necessary electrical connections for the circuit to operate as intended. Their conductivity allows for thetransmission of electrical signals between different elements, forming the essential links thatenable communication and cooperation among circuit components. Beyond their basic rolein establishing electrical connections, connecting wires contribute significantly to the organization and structure of circuit layouts. Their flexibility allows for the creation of specific signal paths, aiding in the systematic arrangement of components.

Figure 1.8 Connecting wires

where designers and engineers need to troubleshoot and optimize circuit configurations. Inessence, connecting wires are not just functional components; they are integral to the design,organization, and functionality of electronic circuits.

1.9 SWITCH

Electronic switches are integral components in modern electrical and electronic systems, serving a variety of functions across industries. They are widely used in home appliances, computers, communication systems, and industrial machinery.Fig 1.9 shows that the switch, they help control the power supply to devices, enabling efficient energy management. In automation systems, electronic switches play a critical role in enabling automated control by receiving signals from sensors or controllers. Additionally, they are utilized in switching power supplies, motor control circuits, and digital logic operations in microprocessors. The ability of electronic switches to operate at high speeds makes them essential in telecommunications for routing signals and in high- frequency circuits like those in radar or satellite systems.

The operation of an electronic switch is based on controlling the flow of electrical current ina circuit using semiconductor components such as transistors, thyristors, or relays. When a smallcontrol signal is applied to the input of the switch, it either allows or blocks the flow of a larger electrical current at the output. For instance, in a transistor-based electronic switch, a voltage orcurrent applied to the base (or gate) modifies the conductivity of the semiconductor material, effectively switching the device "on" or "off."

Figure 1.9 Switch

1.10 RELAY

Electronic relays are versatile components widely used in electrical and electronic systems for automation, protection, and control.Fig 1.10 indicates that, they serve as intermediaries in circuits to isolate and transfer signals between high-power and low-power domains. In industrial applications, relays are employed for motor control, overload protection, and automatic switching in machinery. In the automotive industry, relays are used to control headlights, ignition systems, and fuel pumps. In home automation and appliances, they manage tasks like switching heating systems, air conditioning, and lighting. Relays are also vital in communication systems for signalrouting, and they play a key role in safety-critical applications such as fault detection in power grids, where they isolate faulted sections to protect the system. Their ability to control high- power devices with a low- power signal makes them indispensable across various domains.

The working principle of an electronic relay involves using an electromagnetic coil to control themechanical switching of contacts. When a low-power electrical signal is applied to the relay's coil, itgenerates a magnetic field. This action allows the relay to control a separate high-power circuit using a low-power input. Advanced electronic relays, such as solid-state relays (SSRs), operate without moving parts. Instead, they use semiconductor devices like transistors orthyristors to achieve the switching function.

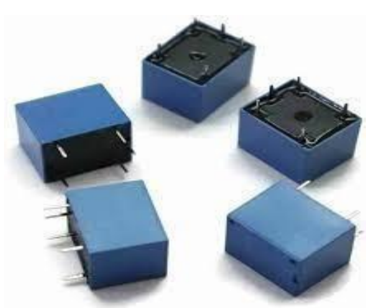

Figure 1.10 Relay

CHAPTER 2

AUTOMATED WATER PUMP CONTROLLER

2.1 ABSTRACT

An automated water pump controller is an innovative solution designed to efficiently manage water usage while reducing manual intervention and ensuring optimal operation of waterpump systems. This system leverages sensor technology, such as water level sensors, flow meters,and pressure sensors, to monitor and regulate water levels in tanks, reservoirs, or pipelines[1]. By automatically activating the pump when water levels drop below a predetermined threshold and deactivating it once the desired level is reached, the controller prevents overflows and dry runs, protecting the pump from damage and extending its lifespan. Advanced controllers may integrate microcontrollers, IoT connectivity, and user interfaces, enabling remote monitoring andcontrol through smartphones or computers[2]. Additionally, such systems can include energy- efficient features, such as scheduling operations during off-peak hours or utilizing renewable energy sources. By optimizing water use and reducing wastage, these controllers contribute to water conservation, operational efficiency, and sustainability, addressing critical challenges in water resource management.

Modern versions may integrate IoT (Internet of Things) features, allowing users to monitor andmanage pump operations remotely through smartphones or web interfaces. Such systems can provide alerts and notifications about water levels, pump performance, or potential faults, enhancing reliability and user experience[3]. Additionally, energy- efficient designs may optimize pump operation by scheduling activity during off-peak electricity hours or leveraging renewable energy sources, such as solar power, to reduce energy costs and environmental impact.

2.2 INTRODUCTION

Water is a critical resource, and its efficient management is essential for sustaining life and supporting agricultural, industrial, and domestic activities. Traditional water pumping systems often require manual operation, which can lead to inefficiencies, such as water wastage,overflows, pump dry runs, and increased energy consumption. These issues not only strain waterresources but also result in higher maintenance costs and reduced lifespan of the pump system. To address these challenges, automated water pump controllershave emerged as an advanced solution that leverages technology to optimize water management.By automating this process,the system ensures that water levels are maintained within desired limits, preventingoverflows and protecting the pump from damage caused bydry running.

In addition,modern controllers often incorporate advanced features, such as IoT connectivity, allowing users to monitor and manage pump operations remotely via smartphones or computers[4].In industrial settings, they support efficient water circulation incooling systems, boilers, and other critical processes. Furthermore, municipal water supply systems rely on automated controllers to regulate and distribute water effectively to meet public demand.

The implementation of automated water pump controllers also contributes to sustainability by optimizing energy consumption and reducing the overall environmental impact. Featuressuch as programmable timers, renewable energy integration, and energy-efficient operationmake these systems a cost-effective and environmentally friendly solution[5] . As global concerns about water scarcity and energy efficiency grow, the adoption of automated water pump controllers is becoming increasingly important, offering a smart and practical approach to water resource management.

2.3 COMPONENTS USED

- 555 Timer IC
- Resistor
- Capacitor
- Cables and Connectors
- Diodes
- Bread Board
- LED'S
- Switch
- Relay

2.4 CIRCUIT DIAGRAM

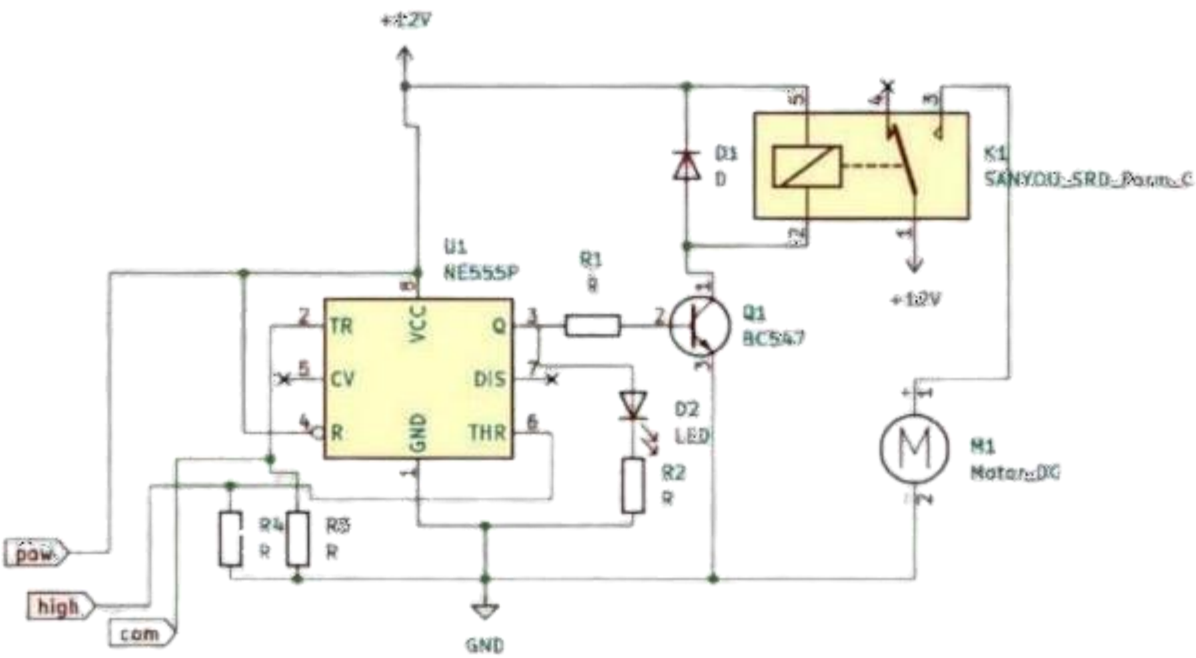

Figure 2.1 Circuit Diagram

2.5 WORKING MODEL

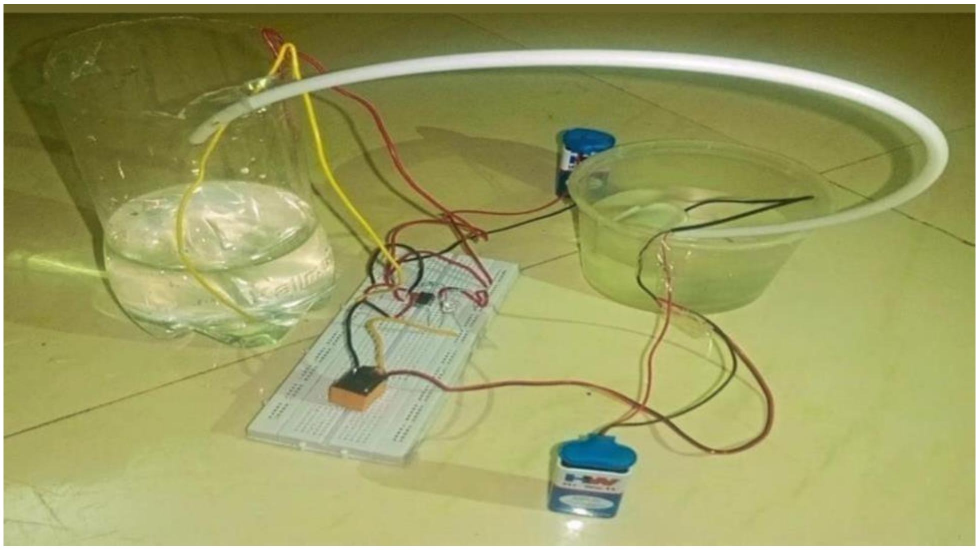

Figure 2.2 Working model

2.6 BLOCK DIAGRAM

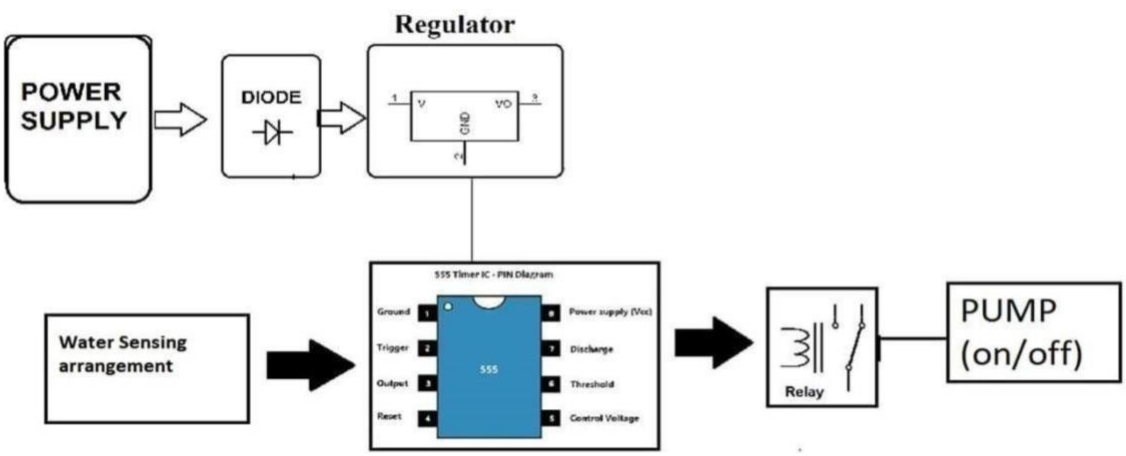

Figure 2.3 Block Diagram

2.6.1 POWER SUPPLY

A power supply converts alternating current (AC) from the main power source into a stable direct current (DC) suitable for powering electronic devices. The process begins with a step-down transformer, which reduces the AC voltage to a lower level. Next,rectification occurs,where diodes convert the AC into pulsating DC.

2.6.2 DIODE

A diode is a semiconductor device that allows current to flow in one direction only, functioning as a one-way valve for electrical current. The working principle of a diodeis based on thePN junction, where two types of semiconductor materials, p-type and n- type, are joined together.

2.6.3 REGULATOR

A voltage regulator maintains a constant output voltage despite variations in input voltage or changes in the load. It works by automatically adjusting the output to staywithin a specific range.

2.6.4 RELAY

A relay is an electrically operated switch that uses an electromagnet to control The opening and closing of contacts. The working principle of a relay is based on the electromagnetism phenomenon. When a current flows through the coil of the relay, it creates a magnetic field, which activates the armature, a movable metal part.

2.6.5 INTEGRATED CIRCUIT

An Integrated Circuit (IC) is a compact arrangement of interconnected electronic components, such as transistors, resistors, capacitors, and diodes, fabricated on a semiconductor material. The miniaturized design of an IC allows for the integration of multiple functions and electronic circuits into a single chip, providing a significant advancement in electronic technology.

2.7 ADVANTAGES

- Cost-Effective
- Convenience
- Automatic operation
- Time Saving
- Easy Installation
- Consistence Water Pressure
- Enhanced Safety

2.8 APPLICATIONS

- Home Water Tanks
- RainWater Harvesting

Figure 2.4 Rainwater Harvesting

- Garden Irrigation

Figure 2.5 Garden Irrigation

- Industrial Home Water Tanks
- Water Tank and Reservoir
- Firefighting Systems

CHAPTER 3

AUTOMATED ROOF SHED BY USING RELAY

3.1 ABSTRACT

The “Automatic Roof Shed Using and Relay” module introduces an advanced system designed to transform the dynamics of outdoor spaces by seamlessly integrating modern electronic components with traditional architectural elements. This innovative module is engineered to automate the deployment and retraction of roof sheds, offering anunparalleled level of adaptability to changing weather conditions[6]. The module capitalizes on the unique capabilities relays,merging their functionalities to orchestrate a sophisticated and responsive control system. In operation, the relay play a central role, providing precision and accuracy in signal amplification and switching. This, in turn, enables meticulous control over the relay, forming the cornerstone of the automated roof shed mechanism. The relay,acting as a robust and versatile switch, regulates the physical movement of the roof shed, responding intelligently to environmental stimuli.

This module is a testament to the synergy between technology and design, enhancing outdoor spaces with a dynamic and adaptable roofing solution[7]. It transcendsthe limitations of static roof structures by introducing a responsive system that caters to various weather conditions. Whether providing shelter during rain, shading from intense sunlight, or creating an open- air experience on pleasant days, the module redefines the usability of outdoor areas[ref 8].By seamlessly blending modern electronic components with traditional roofing elements, the “Automatic Roof Shed Using Relay” module represents a harmonious fusion of innovation and functionality.

3.2 INTRODUCTION

Module heralds a paradigm shift in outdoor space management, marrying contemporary electronic ingenuity with timeless architectural design. This Innovative module introduces an automated system that redefines the role of roof sheds by seamlessly adapting to the dynamic nuances of weather conditions[8]. By harnessing the capabilities relays, this module pioneers an intelligent solution for controlling the deployment and retraction of roof sheds. Their unique ability to amplify and switch signals provides the necessary control dynamics for orchestrating the movement of the roof shed. Complementing this, the relay emerges as a robust switch, translating the electronic commands into tangible physical actions, making the automation process seamless and efficient[9]. This module’s significancelies in itstransformative impact on outdoor spaces.

It transcends conventional static roof structures, introducing a responsive system that adapts organically to varying weather conditions. Whether sheltering from rain, providing shade onsunny days, or allowing an open-air experience during mild weather, the module epitomizes the marriage of technology and architectural functionality[10]. Ideal for both residential and commercial applications, the “Automatic Roof Shed Using Relay” module stands as atestament to innovation, offering an intelligent, adaptable, and user- friendly solution to enhance the comfort and utility of outdoor environments.

An Automated Roof Shed Controller is an innovative system designed to enhance the functionality and convenience of roof sheds by automating their operation. This system utilizes sensors, actuators, and microcontroller units to monitor environmental factors such as temperature, humidity, and rainfall, enabling the roof shed to respond dynamically to changing conditions. The controller automatically adjusts the position of the roof to provide optimal shelter or ventilation basedon real-time data, ensuring energy efficiency, safety, and comfort. With features like remote access, time scheduling, and integration with smart home systems.

3.3 COMPONENTS USED

- Two channel relay
- One channel relay
- Rain Sensor
- 9v Battery

3.4 CIRCUIT DIAGRAM

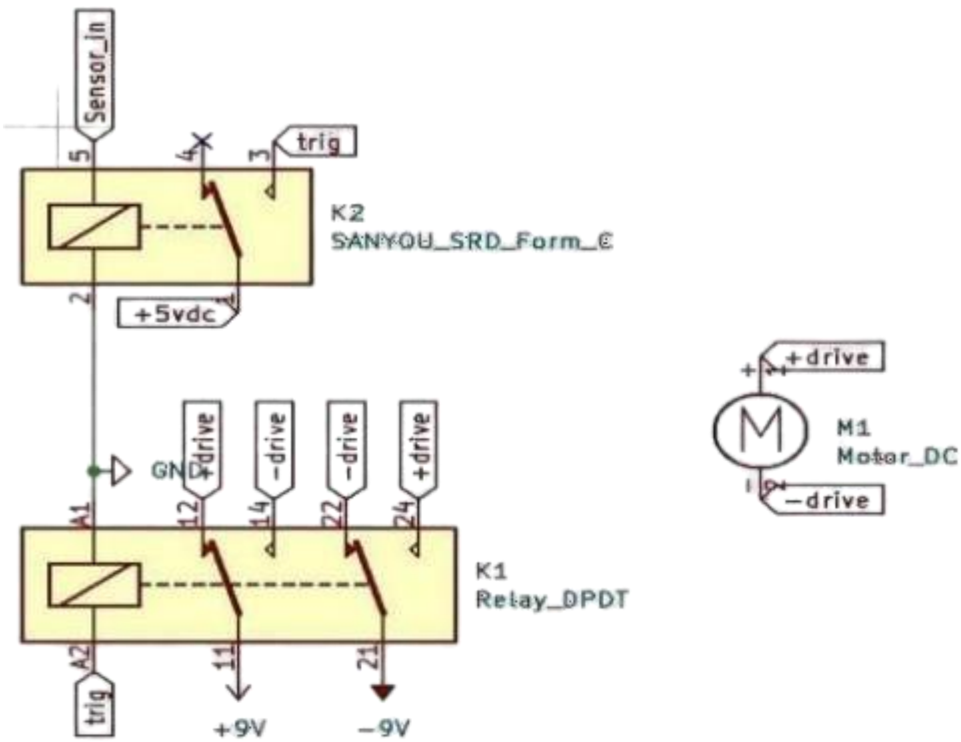

Figure 3.1 Circuit Diagram of Automatic Roof Shed Using Relay

3.5 WORKING MODEL

The "Automatic Roof Shed Using Relay" circuit is ingeniously designed to bring automation and intelligence to outdoor space management. At its core, the circuit utilizes a relay to control the deployment and retraction of the roof shed, introducing a responsive and adaptive mechanism. The relay in the circuit serves as a switch that can beactivated or deactivated by an electric current. The control signal, likely originating from an external source or sensor, is applied to the base of the Relay. When this signal is present, the amplifies allowing a larger current to flow through the relay coil. This, in turn, energizes therelay, causing its normally open (NO) contact to close. The NO contact is a pivotal elementin the circuit, and its state dictates the connection between the two terminals. In itsnormal state (when the relay is not energized), the NO contact is open, meaning is no electrical connection between the terminals. However, when the relay is activated, the NO contact closes, establishing a connection between the terminals. This contact is strategically employed to control a motor or another mechanism responsible for the movement of the roof shed. The resistor circuit on the right side of the diagram, powered by a +5V source, adds a layerof complexity to the system. The two resistors in series create a voltage divider, and the unidentified component marked with "X" introduces variability to the circuit. This component, likely a sensor or switch, may alter the resistance in response to certain conditions. Consequently, this variable resistance can act as a trigger, initiating the automation process based on environmental or user-defined parameters. In summary, the circuit functions as a responsive control system for roof sheds. The relay collaboration, coupled with the resistor circuit, orchestrates a sophisticated mechanism that adapts to changing conditions. This intelligent design enhances outdoor spaces by providing an automated, user-friendly solution managing roof sheds with precision and efficiency.

Figure 3.2 Working Model

3.6 BLOCK DIAGRAM

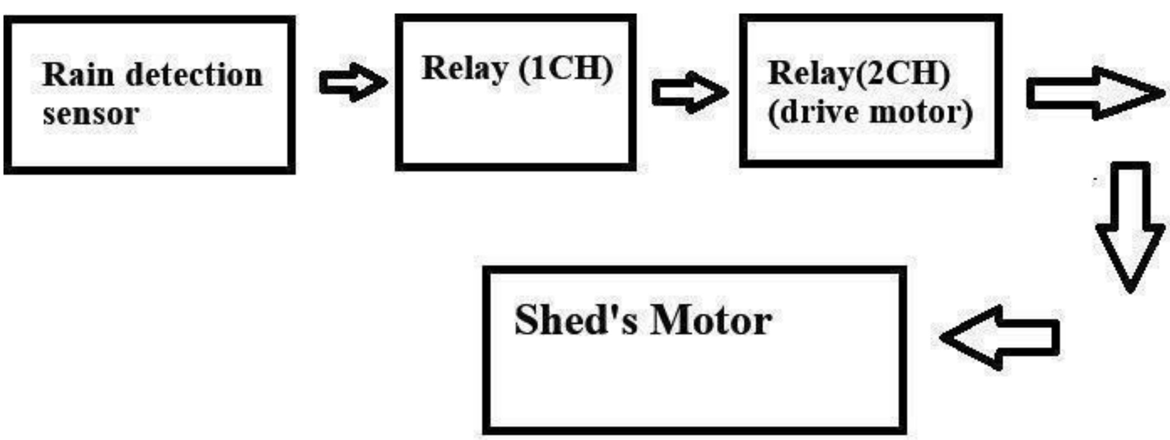

Figure 3.3 Block Diagram

3.6.1 RAIN DETECTOR SENSOR

A rain detector sensor operates on the principle of measuring the presence or absence of rain using a conductive surface. It typically consists of two or more conductive plates orstrips, which are arranged in such a way that they are exposed to the rain. When raindrops fall on the sensor, they create a conductive path between the plates by bridging the gaps, which changes the electrical resistance or capacitance.

3.6.2 RELAY

A relay operates on the principle of electromagnetism. It consists of an electromagnet,a set of contacts, and an armature. When an electric current passes through the coil of the electromagnet, it generates a magnetic field that pulls the armature toward the coil, causing the contacts to either open or close, depending on the relay's design. This action allows a low-power signal to control a higher-power circuit, enabling the relay to switch on or off devices such as motors,lights, or other electronic systems.

3.6.1 SHED MOTOR

The working principle of a shaded pole motor is based on the concept of a magneticfield induced by a coil wound around a portion of the motor's stator pole. The stator of the motor has a single-phase alternating current (AC) supply, and part of each pole has a small coil, called a "shading coil." When AC flows through the stator winding, it generates a rotating magnetic field. The shading coil creates a delayed magnetic flux in the shaded portion of the pole, causing a slightphase shift in the magnetic field. This phase difference between the unshaded and shaded portionsof the stator creates a rotating magnetic field that induces motion in the rotor. The rotor, typicallya squirrel-cage type, starts rotating in the direction of the rotating magnetic field.

3.7 ADVANTAES

- Cost Maintenance
- Automation
- Energy-Efficient
- Durability
- Simple Design and Implementation
- Weather Protection
- Low Maintenance
- Safety

3.8 APPLIATION

- Residential rooftop gardening
- Commercial rooftop gardening

Figure 3.4 Commercial rooftop gardening

- Community rooftop gardening

- Residential Roof Sheds

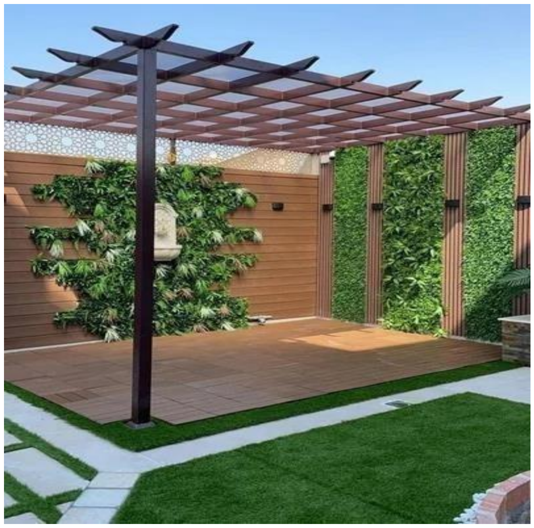

Figure 3.5 Residential roof shed

- Commercial Outdoor Spaces
- Garden and Patio Automation
- Park and Recreational Area Management
- Industrial Open-Air Facilities
- Smart Building Integration

CHAPTER 4 CONCLUSION

The automated water pump controller is a transformative solution that addresses the inefficiencies and challenges associated with traditional water management systems. By leveraging sensor-based technology, these controller sensureprecise monitoring and automatic operation of water pumps, eliminating the need for manual intervention. They prevent common issues such as overflows, dry runs, and excessive energy consumption, thereby enhancing the reliability, lifespan, and efficiency of water pumping systems. With the integration of advanced features like IoT connectivity, real-time monitoring, and energy-efficient operation, automated controllers not only improve user convenience but also contribute to water conservation and sustainability.

The automated roof shed controller is an innovative and practical solution designed to enhance convenience, efficiency, and protection in residential,commercial,and industrial settings. By utilizing sensors and intelligent control mechanisms, this system automatically adjusts the roof shed based on environmental factors such as rainfall, sunlight intensity, wind speed, or temperature. It eliminates the need for manual intervention, ensuring timely and accurate adjustments to protect interiors, maintain comfort, and optimize energy efficiency.The integration of automation technologies, such as microcontrollers, IoT connectivity, and remote control capabilities, further enhances the system's functionality by allowing real-time monitoring and seamless operation. This adaptability makes it ideal for applications ranging from smart homes and greenhouses to warehouses and outdoor recreational areas.

REFERENCES

1. Abate.A , Bessa.I, Cattaruzza.D, Chaves.L, Cordeiro.L, David.C, et al.,"DSSynth"*Proc. Vol 32,n0.5,* Oct. 2021.

2. Bertsekas.D.P, Dynamic Programming and Stochastic Control, Orlando,FL,USA:Academic,vol 9,no.4, 2020.

3. Camacho.E.F and Alba.C.B., Model Predictive Control, London,U.K.:Springer,vol 12,no.4, 2023.

4. Donzé.A and Maler.O, "Robust satisfaction of temporal logic over real-valued signals", pp. 92-106,vol 6,no.3, 2022.

5. Fan.C, Mathur.U, Mitra.S and Viswanathan.M "Controller synthesismadereal",*Proc. 30th Int. Conf. Comput.vol 5,no.3,* 2018.

6. Kumar.K.C. et al., "Design and Development of Automated Water RoofShedController Using Arduino, vol. 69, no. 5, pp. 1054-1061, May 2021.

7. Mishra.P.K. et al., "Automated Water Roof Shed Controller Using MachineLearning-Based IoT System," vol. 16, no. 4, pp. 2314-2323,April 2020.

8. Singh.G et al., "IoT-Based Automated Water Roof Shed Controller forSmartBuildings,", vol. 7, no. 4, pp. 3414-3423,April 2020.

9. Yang Z.L and Chen.G"Design and research of amphibious cleaningrobot.vol 8, 112-116, Jul. 2017.

10. Yuyi.Z, Yu.Z , Huanxin.L ,Yunjia.L and Liang.L, "Control systemdesign for a surface cleaning robot", vol. 10, pp. 220, Jan. 2013.