POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

WATER QUALITY MONITORING SYSTEM USING IOT

NAME	REGISTRATION NO
DHISALENY A/P RAMAN	08DEU20F2013

JABATAN KEJURUTERAAN ELEKTRIK

SESI 2 2022/2023

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This report submitted to the Electrical Engineering Department in fulfillment of the requirement for a Diploma in Electrical Engineering

JABATAN KEJURUTERAAN ELEKTRIK

SESI 2 2021/2022

CONFIRMATION OF THE PROJECT

The project report titled "Water Quality Monitoring System Using IOT" has been submitted, reviewed and verified as a fulfills the conditions and requirements of the Project Writing as stipulated

Checked by:

Supervisor's name:

Supervisor's signature: 

Date :

Verified by:

Project Coordinator name :

Signature of Coordinator :

Date :

"I acknowledge this work is my own work except the excerpts I have already explained to our source"

1. Signature :

Name : DHISALENY A/P RAMN

Registration Number : **08DEU20F2013**

Date :

DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE : WATER QUALITY MONITORING SYSTEM USING IOT

SESSION: SESI 2 2022/2023

1. I, **1. DHISALENY A/P RAMAN 08DEU20F2013**

   This is a final year student of **Diploma in Electrical Engineering, Department of Electrical, Politeknik Sultan Salahuddin Abdul Aziz Shah**, which is located at **Persiaran Usahawan,40140 Shah Alam Selangor Darul Ehsan**. (Hereinafter referred to as 'the Polytechnic').

2. I acknowledge that 'The Project above' and the intellectual property therein is the result of our original creation /creations without taking or impersonating any intellectual property from the other parties.

3. I agree to release the 'Project' intellectual property to 'The Polytechnics' to meet the requirements for awarding the **Diploma in Electrical Engineering** to me.

Made and in truth that is recognized by;

a) **DHISALENY A/P RAMAN**) .

(Identification card No: - 08DEU20F2013) ...…….

) **DHISALENY A/P RAMAN**

In front of me, **PN. NORHAYATI CHE HUSIN**) .....

( ) **PN. NORHAYATI**

As a project supervisor, on the date: **CHE HUSIN**

ACKNOWLEDGEMENTS

I have taken efforts in this Project. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them. I am highly indebted to PN. NORHAYATI CHE HUSIN for their guidance and constant supervision as well as for providing necessary information regarding the Project & also for their support in completing the Project.

I would like to express my gratitude towards my parents & member of (Electrical Department) for their kind co-operation and encouragement which help me in completion of this Project. I would like to express my special gratitude and thanks to industry persons for giving me such attention and time.

My thanks and appreciations also go to my colleague in developing the Project and people who have willingly helped me out with their abilities.

ABSTRACT

Water pollution has been an increasing problem over the last few years. Water personal satisfaction may be a standout amongst those primary variables with control well-being and the state of sicknesses. Lakes and waterways would be those fundamental wellsprings about drinking water, which impressively rely on upon water personal satisfaction (refers to the physical, chemical, and living aspects of water). The purpose of this project is due to water pollution has been an growing hassle over the previous few years. Water non-public delight may be a standout amongst those number one variables with manipulate nicely-being and state for illnesses. Lakes and waterways would be those fundamental wellsprings about ingesting water, which impressively rely on water private satisfaction to the physical, chemical, and living components records approximately water). Water is a completely important need for everybody, this makes the community very worried about the best of the water they use. Due to the fact they didn't know the quality of water that using in daily life.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The purpose of this project because of water pollution has been an increasing problem over the last few years. Water quality monitoring in the current century is a growing challenge because of the large number of chemicals used in our everyday lives and commerce that can make their way into our waters. Lakes and waterways would be those fundamental wellsprings about drinking water, which impressively rely on water personal satisfaction to the physical, chemical, and living aspects facts about water). Water is a completely important need for everybody, this makes the community very worried about the best of the water they use. Due to the fact they didn't know the quality of water that using in daily life.

1.2 Background Research

One of the UN-Water's tasks is to facilitate interagency information exchange, including sharing of experiences and lessons learned, and serve as a clearing house for policy-relevant information, assessment and advice on status and trends at global and regional levels, and for providing Member States with a collective point of entry to the system's initiatives and responses in areas within its purview. This project proposal details how to improve the information exchange between agencies through the proposed Federated Water Monitoring System (FWMS), and provides an outlet through which key statistics can be intuitively displayed, using the Key Water Indicator Portal (KWIP). UN-Water has generated a list of 15 indicators that provide key information by country. They are extracted from databases managed by various international organizations. The KWIP will allow users visiting the UN-Water statistics page to quickly extract important information regarding any selected country. Figure 1 presents an example of the key indicators for a country, as presented in a mockup during the UN-Water meeting in August 2009 in Stockholm. The concept was appreciated by the organizations present at the meeting. The Federated Water Monitoring System provides the technology through which the data exchange between UN agencies and between UN agencies and the KWIP can be streamlined.

1.3 Problem Statement

Considering that water is important resource in our daily life. Therefore, we must ensure the quality and type of water we receive to use in our daily lives. The problem that I face in my housing area that is in Rawang , Selangor the water supply that I received at my housing area is sometimes not good quality. The water supply looks clean but the quality of the water is somewhat doubtful because we cannot see the fine molecules in the water.

1.4 Research Objectives

The main objective of this Project is Water Quality Monitoring System using Iot

More specifically the principal objective of this research are:

1. To design apps that show the pH level of water and give suggestions.
2. To implement this project at house area and river
3. To develop the device using Wi-Fi to verify the pH level by sending the message to the apps and get the notification in the phone.

1.5 Scope of Research

To achieve the research objectives, two research questions are raised to help the researcher in achieving the research objectives. The research question are as follows:

Question 1: What can the water monitoring system measure?

Question 2: Why is it important to monitor water quality? Firstly, users can know the quality of the water used. Then, users can identify the type of water. Lastly, users can access information by them via smart phone.

1.6 Chapter Summary

In conclusion, this project will be very useful to society by helping them to improve Water Quality Monitoring. The project also aims to be able to detect the Water Quality in a short time. To find out whether the Water is Acid, Alkaline or neutral.

CHAPTER 2 LITERATURE VIEW

2.1 Introduction

This chapter describes the beginning of Water Quality Monitoring System and the history behind the occurrence of this tool. This chapter also tells the concept of tools that can help Users improve to their quality of water for daily uses . Understanding and analyzing is an important thing to create a project because it can be a reference before we do the project .

2.2 Previous Research

i) HISTORY OF WATER QUALITY MONITORING SYSTEM

- The length and the catchment area of the Skudai are 40 km and 325 km2, respectively. The Skudai watershed consists of urban, semi-urban, and natural areas depending on the percent of land use for forest, commercial, communication, residential, and other purposes. The inflow in the Skudai watershed comes from the Skudai, Senai, Melana, Dana, and Kempas rivers. The land use in the Skudai watershed was determined by applying a Geographic Information System (GIS) through ArcGIS Version 10. The sampling stations were decided from the land use maps of the Skudai watershed. The entry points of the tributaries to the Skudai were selected for collecting samples for water quality tests. Suspended solids (SS) are natural pollutants and cause turbidity in the river water [26]. The excess amount of SS in water can also be an indicator of land erosion in the river catchment.

-Water quality degradation due to ammonianitrogen (NH3-N) remains a crucial environmental and public concern worldwide because it can cause eutrophication. Low pH causes toxic elements and compounds to become available for uptake by aquatic plants and animals. Water samples were collected from eight sampling stations in different locations along the Skudai and its tributaries in September 2014. Analysis for parameter such as BOD, COD, SS, and NH3 -N were conducted in Laboratory. The higher dissolved oxygen (DO) values represent good water quality and best for a healthy ecosystem.

- The Chini Lake Is located in the south eastern region of the state of Pahang, Malaysia. Surface water samples were collected from about 10cm below the water surface using 500ml HDPE bottle. For BOD the samples were collected in the dark BOD bottle (300ml). The BOD, COD, TSS, TDS ammoniacal-N, nitrate, phosphate and sulphate were measured in accordance with standard procedures. Six water quality parameters DO, BOD,COD, TSS, ammoniacal-N and Ph were used in the calculation of the DOE-water quality index. Hydrological analysis was carried out to evaluate the water level characteristics of the water body as well as the drainage systems.

2.2 Table of Journal

NO	TITLE/AUTHOR	OBJECTIVE	METHOD	RESULT
1	Water Quality Monitoring System ➢ **Roshna Sapkal** Bharati Vidyapeeth's College of Engineering for Women,Pune-43 · Electronics and Telecomunication	This paper describes the main reason for need of effective and efficient water level monitoring and control of water quality in flat system tends to keeping the human resources healthy and sustainable, and to reduce the usage of water for household purposes.	Incredible methods are used by collecting water samples, testing and analyses in water laboratories alone. However, It is not always easy to be captured, analyses and fast dissemination of information to relevant users for making timely and well-versed decisions.	In this project Water Sensor System prototype is developed for water level and quality monitoring in society is presented. These kind of growth was introduced by the assessment of widespread atmosphere that Including accessibility of cellular network Coverage at the site of process.
2	Smart Water Quality Monitoring System ➢ **Vaishnavi V, Varshitha R C, Tejaswini M, Needhu Rebecca Biju Mr. Kumar K, Assistant Professor K S** Institute of Technology, Bangalore, India,	water monitoring system is necessary to observe the water quality in a large area such as lake, river, and aquaculture. As per the current world situation, Internet of Things (IoT) and remote sensing techniques are used in heterogeneous areas of research for supervising, congregate and analyzing data from the remote locations. In this paper, the suggested system is a minimal price real time water quality monitoring system in IoT environment	This system comprise of numerous sensors for assessing the physical and chemical parameters. The factors of water that can be assessed using these sensors are pH, turbidity, conductivity, dissolved oxygen. U	Using this system the real time quality of water bodies can be determined and the data uploaded over the Internet are analyzed.

2.3 The function of the tool to be used

Arduino is an open source (basic) platform for learning microcontrollers easily and cheaply. The idea for this Arduino came from the art faculty at one of the universities in Ivrea, Italy. The Arduino is, in fact,just a CIP Micro Controller (MicroController) that can be programmed and has RAM and ProgramMemory Board. The blue Arduino only has support circuits such as Voltage Regulator and Serial-USB Programming Chip. The use of Arduino does not need to use the blue Board, and can also only use the AtMEGA328P MicroController Chip and can build its own Application Board.However, the Arduino company has built the Blue Board to simplify PROCESSPROTOTYPING while a project is under construction and d-iR & D.

2.4 Conclusion

From the research that have been done regarding this project, it can be concluded that many advantages and disadvantages were outlined from the previous WATER QUALITY MONITORING SYSTEM, considering all these aspects above, through this project, a MONITORING SYSTEM device will be produced to give the user the best experience they would ever have. In the next chapter, the methodology for the project will be presented.

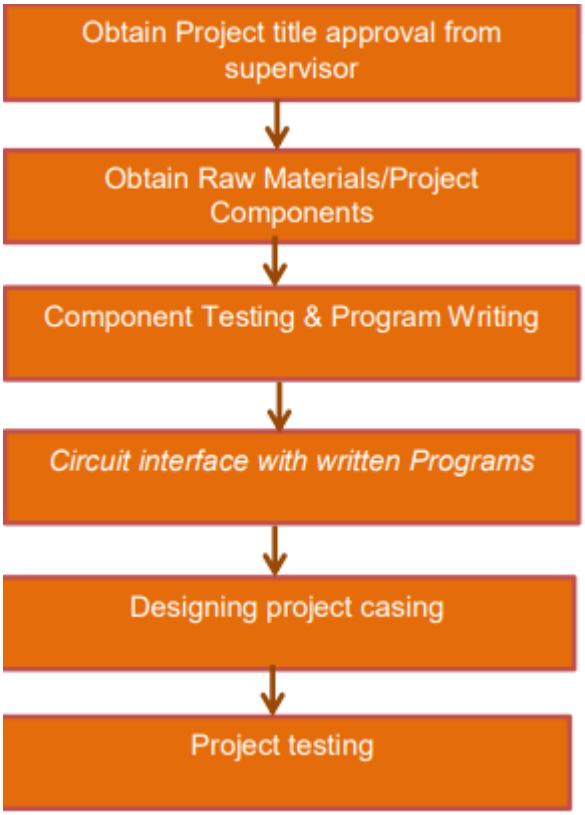
CHAPTER 3

METHADOLOGY

3.1 Introduction

The selection of the project title starts from the ideas that arise and is the first step that needs to be implemented before starting the next work in the project. The chose project title is appropriate according to the type of project which is a combination of hardware and software. Next, work planning or a Gantt Chart should be made as a guideline throughout the implementation of the project in order to be more orderly and tidy. Gantt charts help to launch project execution in a more organized manner.

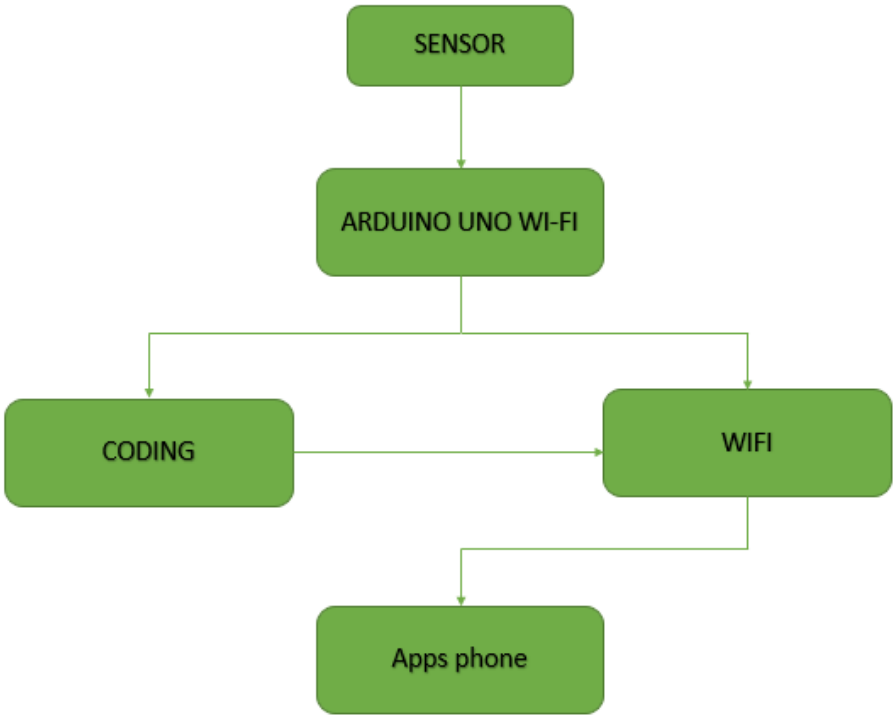
3.2 Format Research



3.3 Project Design and Overview

As mentioned in the previous chapter, the designed controller uses a iot system with Arduino uno as the main controller. The design of the controller circuit using Arduino realizes using Proteus Software and connect all the component and run the circuit successfully. In this project we using Wi-Fi to verify the pH level by sending the message to the apps and get the notification.

3.3.1 Block Diagram of the Project



3.3.2 Flowchart of the Project 2

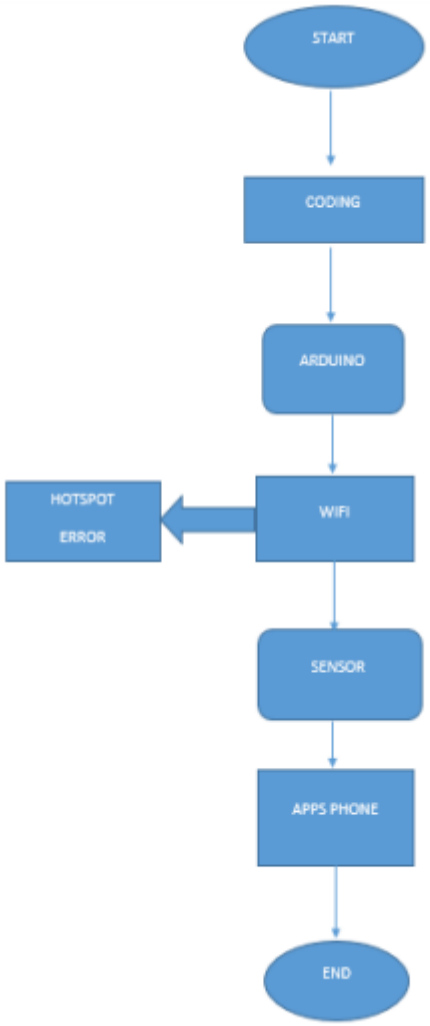


Figure 0.2.2 Flow chart of water quality monitoring system

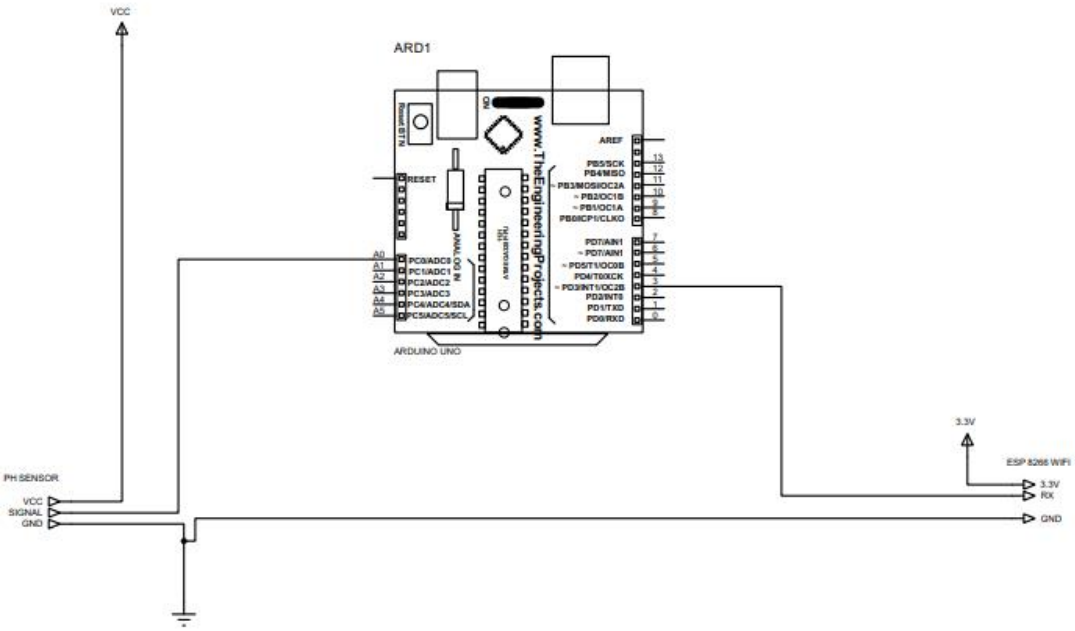
3.3.2 Project Description

Build a water quality monitoring device using pH sensor with the concept of IOT. The "Water Quality Monitoring System" is intended to quickly and accurately identify the kind of water being examined. The water will be tested by a pH sensor pod and the pH level will be shown on apps sent through the message by Wi-Fi on a smartphone.

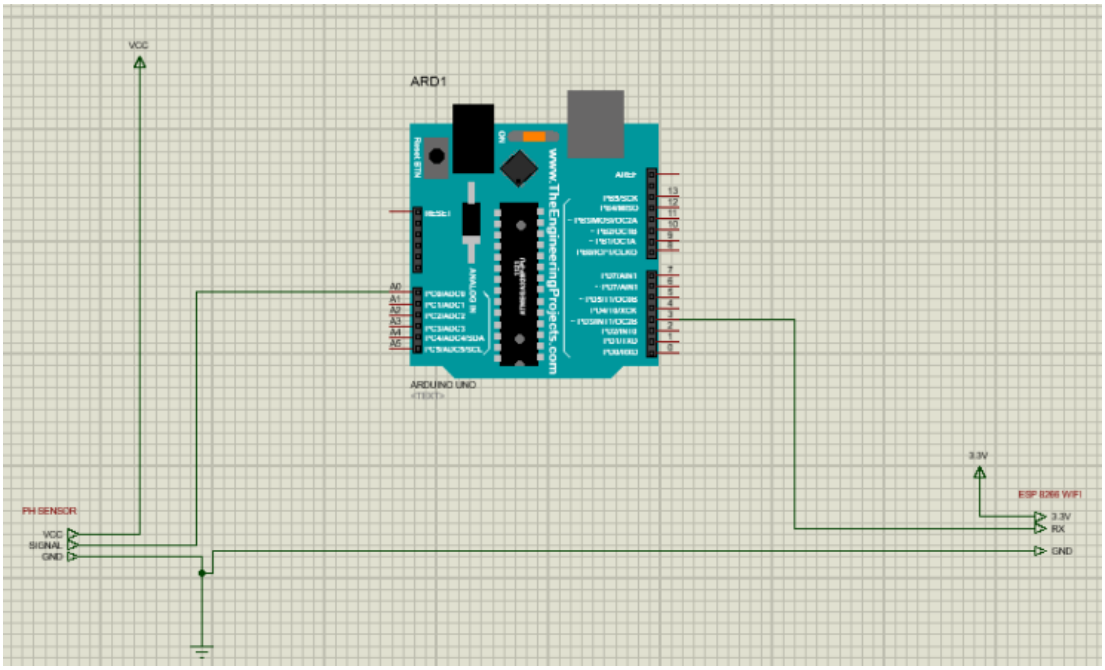
3.4 Project Hardware

This section will show the list of all software and hardware requirements that involve in the development process.We use the arudino ide to do the coding and bulid the circuit using amplifier module,arudino uno wifi,esp8266 and ph pod.

3.4.1Schematic Circuit



3.4.2 Proteus diagram



3.4.3 Description of Main Component

NO.	ITEM
1.	ARDUINO UNO
2.	MALE TO FEMALE WIRES
3.	PH SENSOR ROD
4.	AMPLIFIER MODULE
5.	ESP 8266 WIFI MODULE
6.	CASING BOX 8X5
7.	USB CABLE

3.4.3.1 Component 1

Arduino UNO

Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. Thisboard can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header,and a reset button

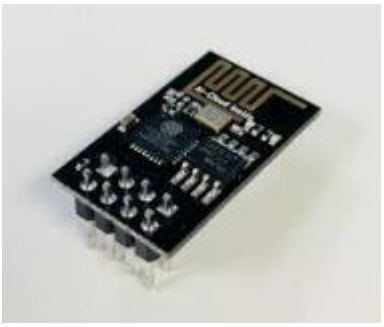
3.4.3.2 Component 2

Ph Sensor Rod

A pH sensor rod, also known as a pH electrode or pH probe, is a device used to measure the acidity or alkalinity of a solution. It consists of a glass or plastic rod with a special membrane at its tip that is sensitive to changes in hydrogen ion concentration (pH) in the solution being tested. The pH sensor rod is one of the most common types of sensors used in pH measurement and is widely used in various industries, including chemistry, environmental monitoring, agriculture, and water treatment. The functioning of a pH sensor rod is based on the principle of ion-selective measurement. The membrane at the tip of the rod contains a gel or solution that acts as a barrier between the internal reference solution and the external solution being tested. This membrane selectively allows hydrogen ions to pass through it, creating a potential difference between the internal and external solutions.

3.4.3.3 Component 3

ESP 8266 WIFI MODULE



The ESP8266 Wi-Fi module is a popular low-cost Wi-Fi chip with embedded TCP/IP protocol stack capabilities, designed for internet-of-things (IoT) applications. It enables microcontrollers and other embedded systems to connect to Wi-Fi networks and communicate with other devices or cloud servers. Wi-Fi Connectivity: The module provides built-in Wi-Fi support, allowing devices to connect to local Wi-Fi networks and access the internet. It supports various authentication and encryption methods, including WPA/WPA2-PSK. IoT Protocols and Services: The ESP8266 module can communicate using standard IoT protocols like MQTT (Message Queuing Telemetry Transport) and HTTP (Hypertext Transfer Protocol). This allows it to interact with cloud-based services and platforms, making it suitable for IoT applications.

3.4.3.4 Component 4

Amplifier Module

An amplifier module, also known as a power amplifier module, is an electronic device that amplifies weak electrical signals to a higher power level. It is commonly used in audio systems, radio frequency (RF) applications, telecommunications, and various other fields where signal amplification is required. Signal Amplification: The primary function of an amplifier module is to increase the power, voltage, or current level of a weak input signal without significantly distorting its waveform. This

amplified signal can then drive speakers, transducers, antennas, or other loads with sufficient power for proper operation. Input and Output: Amplifier modules typically have input and output connections. The input accepts the low-level signal to be amplified, while the output delivers the amplified signal to the load. The input can be analog or digital, depending on the application.

3.5 Project Software

To develop this project, it can be many choices to choose the best software, this is because the selection of software depends on the requirement needed in this project. The software to develop this project is shown below.

NAME OF SOFTWARE	DESCRIPTION
Microsoft Office Word 2013	**As a platform for documentation andpresentation of project**
Google Chrome	**Surfing and searching for example of systemand research about the system**
Blynk iot	**Blynk is an Internet of Things (IoT) platform that allows you to easily build and control projects using various sensors, devices, and platforms. It provides a simple and intuitive way to connect hardware to the internet and build custom mobile applications to monitor and control those devices remotely**
Arduino Source Code	**Used to program the Arduino. This softwareused for write and implement the coding to the Arduino UNO**

3.6 Chapter Summary

The design of this project will be neatly and well designed. The tools to complete this project are available at a nearby electronic store and the price is very reasonable.

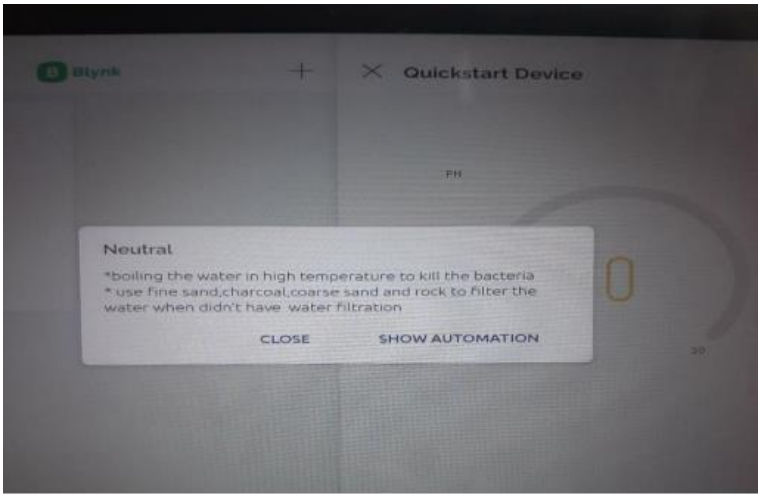
CHAPTER 4

RESULTS AND DISCUSSION

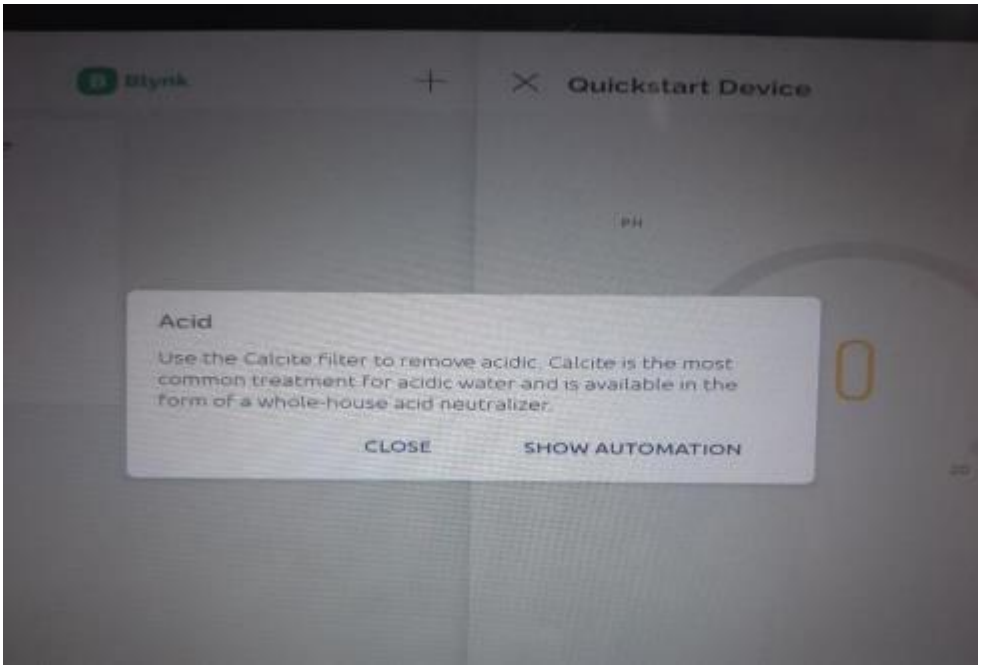
4.1 Introduction

The water quality monitoring system using IoT (Internet of Things) is a sophisticated solution that enables real-time monitoring and analysis of water quality parameters. It leverages the power of connected devices, sensors, and data analytics to collect, transmit, and interpret water quality data. The results obtained from the water quality monitoring system using IoT provide valuable insights into the state of the water bodies under observation. These results are derived from the continuous collection of data from sensors strategically placed in water sources such as rivers, lakes, reservoirs, or even water treatment plants. The system measures various water quality parameters, including pH levels, temperature, turbidity, dissolved oxygen, conductivity, and the presence of specific contaminants.The discussion of the water quality monitoring system's results focuses on the interpretation and implications of the collected data. It involves analyzing the trends, patterns, and anomalies observed in the water quality parameters and their significance in relation to environmental standards, regulatory guidelines, or specific water quality objectives.

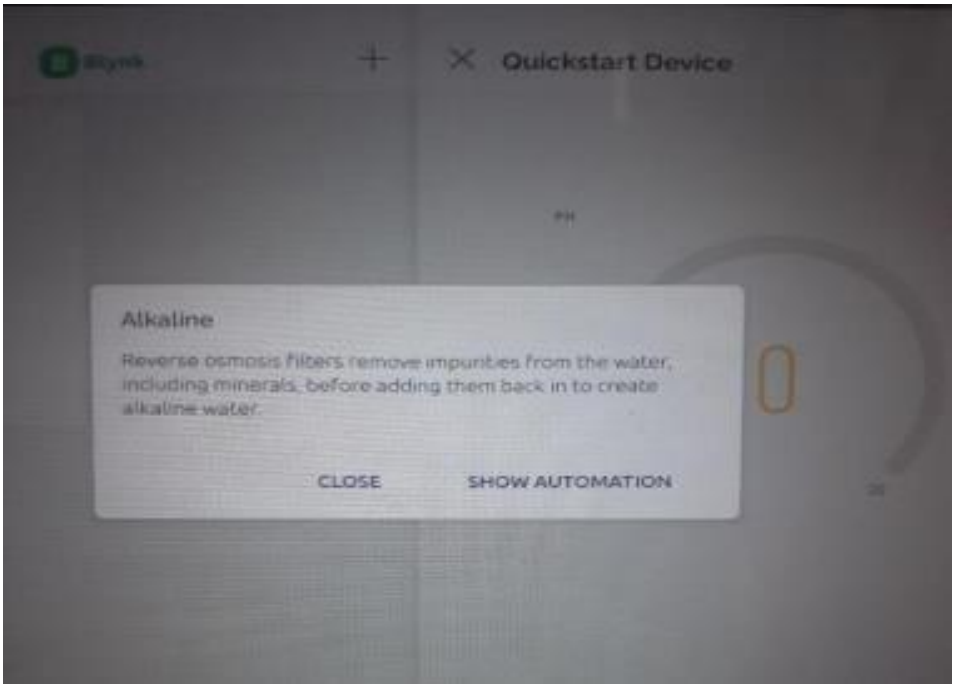
4.2 Results and Analysis



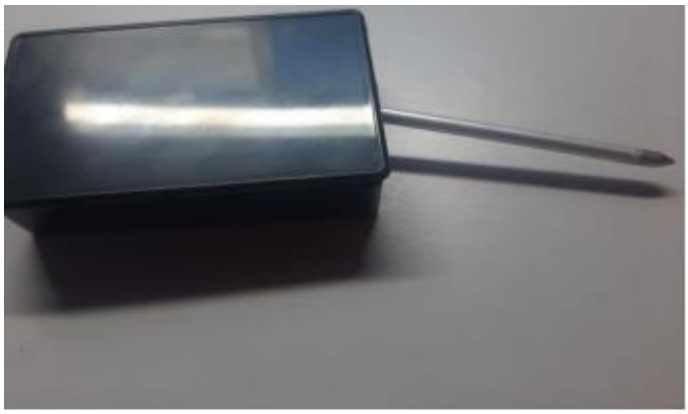
When ph level between 6 to 8 (Neutral)

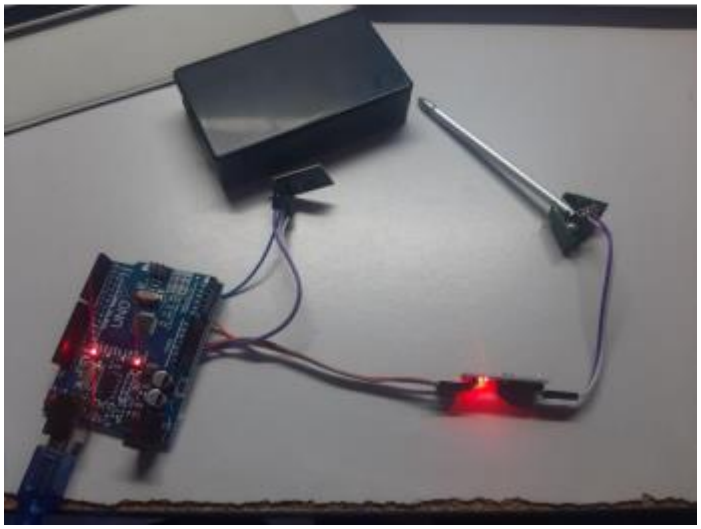


When ph value below 6 that is 0 to 5 (Acid)



When ph level 8 to 14 (Alkaline)





4.3 Discussion

In the discussion, will know the results of the Water Quality Monitoring System by measuring the Ph value. After the Ph sensor detect the quality of the water it will show what type of water for an example Acid, Alkaline or Neutral. In theory we knew that the Ph level for Acid, Alkaline and Neutral. From the figure above the notification will show what type of water and with suggestions how to drink that water. For an example for Acid is Use the Calcite filter to remove acidic. Calcite is the most common treatment for acidic water and is available in the form of a whole-house acid neutralizer and for alkaline is Reverse osmosis filters remove impurities from the water, including minerals, before adding them back in to create alkaline water and finally for neutral is boiling the water in high temperature to kill the bacteria and use fine charcoal, sand and rock to filter the water when didn't have water filtration.

4.4 Chapter Summary

Finally, with the help of our supervisor Puan Misida Binti Senon and other amazing resources such as the internet and books, I can overcomeall the troubles that development throughout the completion of final year project process. Deep to the project, this system with notifications will get on app and email to keep record for the water quality. In addition, it detect the water quality very fast so that we don’t have to wait too long to get results.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The water quality monitoring system using IoT (Internet of Things) is a sophisticated solution that enables real-time monitoring and analysis of water quality parameters. It leverages the power of connected devices, sensors, and data analytics to collect, transmit, and interpret water quality data. The results obtained from the water quality monitoring system using IoT provide valuable insights into the state of the water bodies under observation. These results are derived from the continuous collection of data from sensors strategically placed in water sources such as rivers, lakes, reservoirs, or even water treatment plants.

5.2 Conclusion

This Project demonstrates a smart water quality monitoring system using IoT to validate the system measurement accuracy. In this project, we propose a system that integrates with the IoT technology for real-time water quality monitoring. The system can monitor water quality automatically, and it is low in cost and does not require more manpower. This realtime application generates, collects, transfers, and stores sensor data in the web server. Data analysis was done, and instant reports were generated to display from anywhere and anytime in the web browser. This system was designed to reduce manpower, lower cost, and increase efficiency in water distribution and monitoring. Experiments affirm the good performance of the proposed system. In a nutshell, the system has proved its worth by delivering accurate and consistent data throughout the testing period and with the added feature of incorporating IoT platforms for real time water monitoring, this should be an excellent contender in real time water monitoring solutions. Therefore, this proposed system is reliable for a real environment deployment.

5.3 Suggestion for Future Work

In water quality monitoring system using Iot the suggestion of future work is add the filtration application on the device to filrat the dirty water to pure water with neutral parameter.

1)Enhanced Sensor Technology: Future research can focus on the development of advanced sensor technologies that provide more accurate and comprehensive water quality measurements. This may include sensors capable of detecting emerging contaminants, microplastics, or harmful algal blooms. Additionally, research can be conducted to improve the durability, longevity, and calibration methods of the sensors to ensure reliable and consistent data collection.

2)Mobile Applications and Citizen Science: Future research can explore the development of mobile applications that allow citizens to actively participate in water quality monitoring efforts. This can involve engaging citizens in data collection, reporting water quality observations, and promoting environmental awareness. Research can focus on designing user-friendly interfaces, ensuring data quality control, and establishing mechanisms for effective citizen engagement.

3) Integrated Water Quality Management Strategies: Future research can investigate integrated water quality management strategies that combine the use of IoT-based monitoring systems with other interventions, such as smart water treatment technologies, stormwater management approaches, or sustainable agricultural practices. This holistic approach can help in achieving more comprehensive and sustainable water quality

5.4 Chapter Summary

The water quality monitoring system using IoT is a project aimed at real-time monitoring and analysis of water quality parameters. The results and discussion of this project revolve around several key aspects. The results obtained from the system provide valuable insights into the current state of water quality. These results include trends, patterns, and anomalies observed in various parameters such as pH levels, temperature, turbidity, dissolved oxygen, conductivity, and contaminant presence. The discussion involves comparing these results with established benchmarks or standards to assess compliance and severity of deviations. Additionally, the discussion explores potential causes and sources of water quality issues identified by the system. It may involve investigating pollution sources, human activities, or external factors influencing water quality. The consequences of observed water quality conditions are also discussed, including ecological impact, risks to human health, and implications for various industries dependent on clean water. Financial management is crucial for the project's success, and the discussion addresses aspects such as cost analysis, return on investment, and funding strategies. This analysis helps stakeholders evaluate the financial viability and sustainability of the project. Finally, recommendations for future research are provided, including areas such as enhanced sensor technology, advanced data analytics techniques, integration with water management systems, remote sensing, and citizen science. These recommendations aim to improve the accuracy, efficiency, and effectiveness of water quality monitoring systems using IoT. In summary, the water quality monitoring system using IoT provides valuable results and discussions about the state of water quality, potential issues, financial management, and future research directions. By leveraging IoT technologies, stakeholders can make informed decisions, take appropriate actions, and contribute to the preservation of clean and safe water resources.

CHAPTER 6

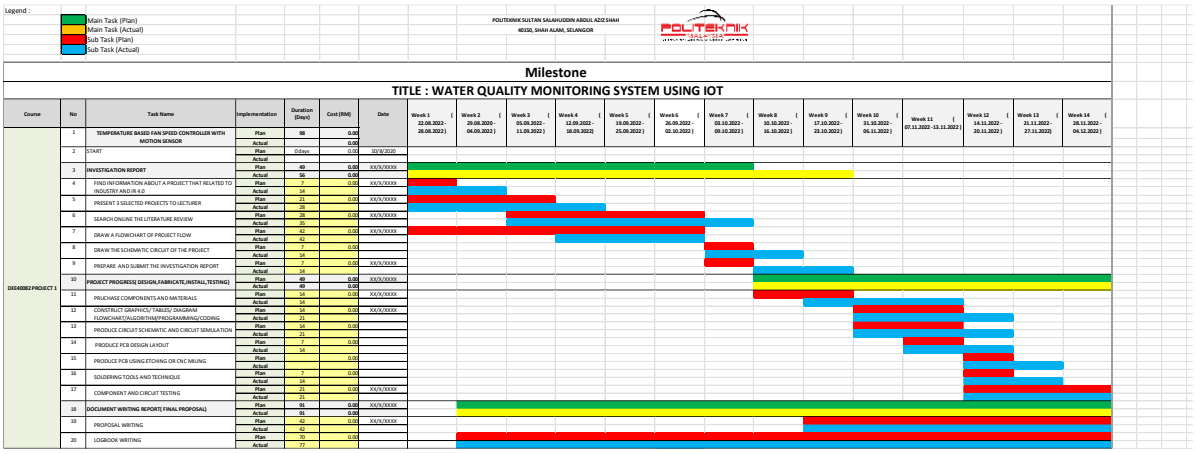
PROJECT MANAGEMENT AND COSTING

6.1 Introduction

The water quality monitoring system using IoT is a comprehensive project aimed at developing a robust and efficient solution for real-time monitoring and analysis of water quality parameters. By leveraging IoT technologies, this project enables the collection, transmission, and interpretation of water quality data from various sources, including rivers, lakes, reservoirs, and water treatment plants. The project involves the deployment of a network of IoT-enabled devices equipped with sensors capable of measuring multiple water quality parameters. These parameters typically include pH levels, temperature, turbidity, dissolved oxygen, conductivity, and the presence of contaminants such as heavy metals or organic pollutants. The devices are strategically placed at specific locations within the water bodies to ensure optimal coverage and representative data collection. The collected data is transmitted wirelessly to a central server or cloud-based platform, where it is securely stored and processed. Advanced analytics techniques are applied to the data to derive meaningful insights and generate real-time results. The system also incorporates user-friendly interfaces, dashboards, and reports to visualize and communicate the results effectively.

6.2 Gant Chart and Activities of the Project

6.3 Milestone



6.3 Cost and Budgeting

NO.	ITEM	QUANTITIES	PRICE(RM)
1.	ARDUINO UNO	1	35.00
2.	MALE TO FEMALE WIRES	3	18.00
3.	PH SENSOR ROD	1	30.00
4.	AMPLIFIER MODULE	1	15.00
5.	ESP 8266 WIFI MODULE	1	18.00
6.	CASING BOX 8X5	1	8.00
7.	USB CABLE	1	7.00
TOTAL			131.00

6.4 Chapter Summary

The water quality monitoring system using IoT is a project aimed at real-time monitoring and analysis of water quality parameters. The results and discussion of this project revolve around several key aspects. The results obtained from the system provide valuable insights into the current state of water quality. These results include trends, patterns, and anomalies observed in various parameters such as pH levels, temperature, turbidity, dissolved oxygen, conductivity, and contaminant presence. The discussion involves comparing these results with established benchmarks or standards to assess compliance and severity of deviations. Additionally, the discussion explores potential causes and sources of water quality issues identified by the system. It may involve investigating pollution sources, human activities, or external factors influencing water quality. The consequences of observed water quality conditions are also discussed, including ecological impact, risks to human health, and implications for various industries dependent on clean water. Financial management is crucial for the project's success, and the discussion addresses aspects such as cost analysis, return on investment, and funding strategies. This analysis helps stakeholders evaluate the financial viability and sustainability of the project. Finally, recommendations for future research are provided, including areas such as enhanced sensor technology, advanced data analytics techniques, integration with water management systems, remote sensing, and citizen science. These recommendations aim to improve the accuracy, efficiency, and effectiveness of water quality monitoring systems using IoT. In summary, the water quality monitoring system using IoT provides valuable results and discussions about the state of water quality, potential issues, financial management, and future research directions. By leveraging IoT technologies, stakeholders can make informed decisions, take appropriate actions, and contribute to the preservation of clean and safe water resources.

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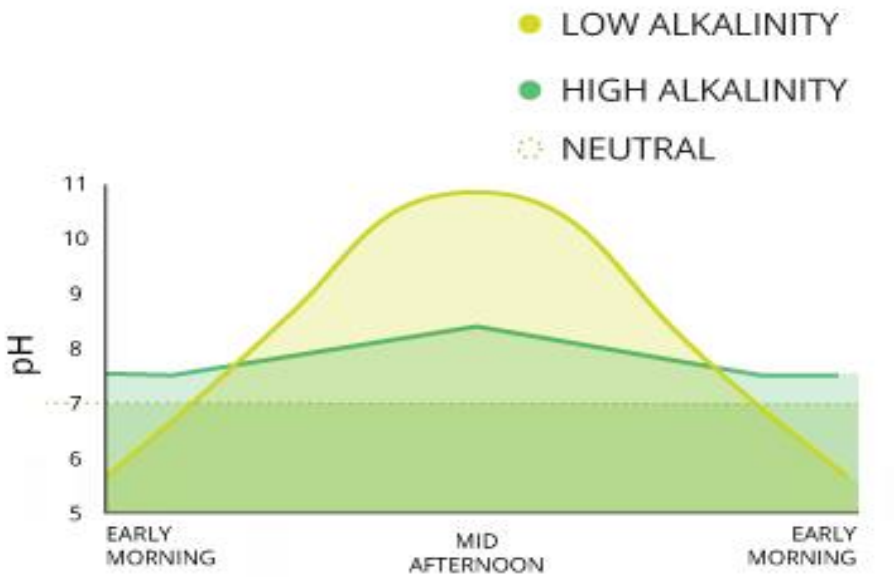
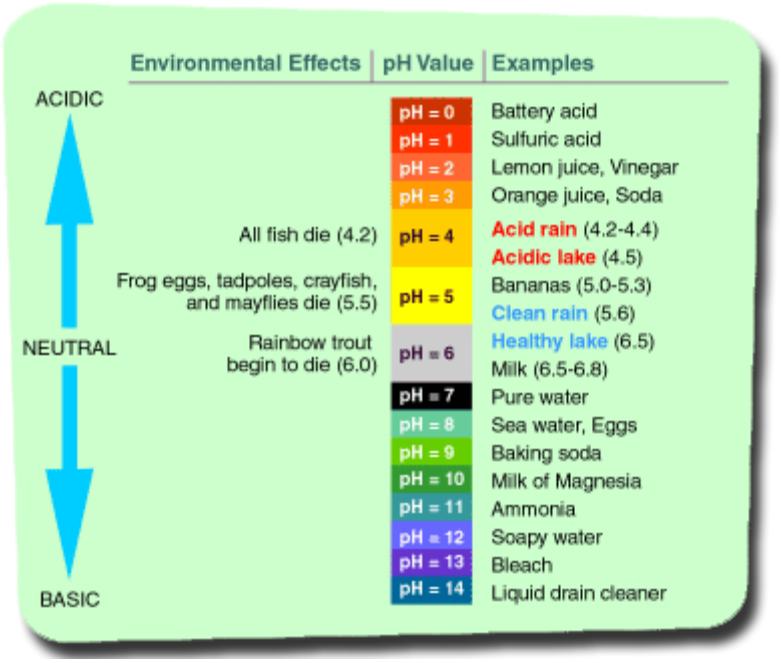
APPENDICES

I. APPENDIX A- DATA SHEET





II APPENDIX B- PROGRAMMING

Coding

```
#include <ArduinoWiFiServer.h>
#include <BearSSLHelpers.h>
#include <CertStoreBearSSL.h>
#include <ESP8266WiFi.h>
#include <ESP8266WiFiAP.h>
#include <ESP8266WiFiGeneric.h>
#include <ESP8266WiFiGratuitous.h>
#include <ESP8266WiFiMulti.h>
#include <ESP8266WiFiSTA.h>
#include <ESP8266WiFiScan.h>
#include <ESP8266WiFiType.h>
#include <WiFiClient.h>
#include <WiFiClientSecure.h>
#include <WiFiClientSecureBearSSL.h>
#include <WiFiServer.h>
#include <WiFiServerSecure.h>
#include <WiFiServerSecureBearSSL.h>
#include <WiFiUdp.h>

// Template ID, Device Name and Auth Token are provided by the Blynk.Cloud
// See the Device Info tab, or Template settings
#define BLYNK_TEMPLATE_ID           "TMPLjVLMVoBt"
#define BLYNK_TEMPLATE_NAME         "Quickstart Template"
#define BLYNK_AUTH_TOKEN            "w1_zekUS-Z8yXI00ZTFoMJczIR5llxTu"


// Comment this out to disable prints and save space
#define BLYNK_PRINT Serial


#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>


char auth[] = BLYNK_AUTH_TOKEN;

// Your WiFi credentials.
// Set password to "" for open networks.
char ssid[] = "PH";
char pass[] = "12345678";

int FLUSH=0;
int Rly1=0, Rly2=0, Rly3=0, Rly4=0, Rly5=0, Rly6=0,  Rly7=0,  Rly8=0;
int Val1=90, Val2=0, Val3=0, Val4=0, Val5=0, Val6=0,  Val7=0,  Val8=0;
```

```
String Temp1x="";
String PHx="";
String Temp2x="";
String Temp1y="";
String PHy="";
String Temp2y="";
String Temp3y="";
String Temp3x="";
String Temp4y="";
String Temp4x="";
String Temp5y="";
String Temp5x="";
String Temp6y="";
String Temp6x="";
String Temp7y="";
String Temp7x="";
String Temp8y="";
String Temp8x="";
String Temp9y="";
String Temp9x="";
String Temp10y="";
String Temp10x="";
int DataIn=0;
float Sens1,WaterLevel=0;
int DDLAY=700,Capasity=3;

BlynkTimer timer;

int pos=0;
bool led_set[2];
long timer_start_set[2] = {0xFFFF, 0xFFFF};
long timer_stop_set[2] = {0xFFFF, 0xFFFF};
unsigned char weekday_set[2];

long rtc_sec;
unsigned char day_of_week;

bool led_status[2];
bool update_blynk_status[2];
bool led_timer_on_set[2];

// This function is called every time the Virtual Pin 0 state changes


// This function is called every time the device is connected to the
Blynk.Cloud
BLYNK_CONNECTED()
{
  // Change Web Link Button message to "Congratulations!"
```

```
 // Blynk.setProperty(V3, "offImageUrl", "https://static-
image.nyc3.cdn.digitaloceanspaces.com/general/fte/congratulations.png");
 // Blynk.setProperty(V3, "onImageUrl",  "https://static-
image.nyc3.cdn.digitaloceanspaces.com/general/fte/congratulations_pressed.png"
);
 // Blynk.setProperty(V3, "url", "https://docs.blynk.io/en/getting-
started/what-do-i-need-to-blynk/how-quickstart-device-was-made");
}

// This function sends Arduino's uptime every second to Virtual Pin 2.
void myTimerEvent()
{

}

BLYNK_WRITE(V10)
{
  Rly1 = param.asInt(); // assigning incoming value from pin V1 to a variable

  if (Rly1==1){
Serial.println("!");

  }
   if (Rly1==0){

  Serial.println("@");
  }

  // process received value
}

BLYNK_WRITE(V11)
{
  Rly2 = param.asInt(); // assigning incoming value from pin V1 to a variable
 if (Rly2==1){
Serial.println("#");

  }
   if (Rly2==0){

  Serial.println("$");
  }

}


BLYNK_WRITE(V12)
{
  Rly3 = param.asInt(); // assigning incoming value from pin V1 to a variable
```

```
}

BLYNK_WRITE(V13)
{
  Rly4 = param.asInt(); // assigning incoming value from pin V1 to a variable


  // process received value

  // process received value
}

BLYNK_WRITE(V14)
{
  Rly5 = param.asInt(); // assigning incoming value from pin V1 to a variable

  if (Rly5==1){

  }

  // process received value
}

BLYNK_WRITE(V6)
{
  Rly6 = param.asInt(); // assigning incoming value from pin V1 to a variable

  if (Rly6==1){

  }

  // process received value
}



BLYNK_WRITE(V1)
{
 Capasity = param.asInt(); // assigning incoming value from pin V1 to a
variable
  Serial.print("*");
 Serial.print(Capasity);
  Serial.println("#");


  // process received value
}
```

```
BLYNK_WRITE(V9)
{
  unsigned char week_day;

  TimeInputParam t(param);

  if (t.hasStartTime() && t.hasStopTime() )
  {
    timer_start_set[0] = (t.getStartHour() * 60 * 60) + (t.getStartMinute() *
60) + t.getStartSecond();
    timer_stop_set[0] = (t.getStopHour() * 60 * 60) + (t.getStopMinute() * 60)
+ t.getStopSecond();

    Serial.println(String("Start Time: ") +
                   t.getStartHour() + ":" +
                   t.getStartMinute() + ":" +
                   t.getStartSecond());

    Serial.println(String("Stop Time: ") +
                   t.getStopHour() + ":" +
                   t.getStopMinute() + ":" +
                   t.getStopSecond());

    for (int i = 1; i <= 7; i++)
    {
      if (t.isWeekdaySelected(i))
      {
        week_day |= (0x01 << (i-1));
        Serial.println(String("Day ") + i + " is selected");
      }
      else
      {
        week_day &= (~(0x01 << (i-1)));
      }
    }

    weekday_set[0] = week_day;
  }
  else
  {
    timer_start_set[0] = 0xFFFF;
    timer_stop_set[0] = 0xFFFF;
  }
}
```

```
//
################################################################################
############################

void setup()
{

  Serial.begin(9600);

  Blynk.begin(auth, ssid, pass);
  // You can also specify server:
  //Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);
  //Blynk.begin(auth, ssid, pass, IPAddress(192,168,1,100), 8080);

  // Setup a function to be called every second
  timer.setInterval(1000L, myTimerEvent);


  pos=0;
}

void loop()
{

  Blynk.run();
  timer.run();
  //-----------------------------------------------------
   while (Serial.available()) {
    // get the new byte:
    char inChar1 = (char)Serial.read();
  if (inChar1 == '*') {
      DataIn++;

    }

     if (inChar1 == 'Y') {



    }

if (inChar1 == '$'){
 Blynk.virtualWrite(V2,"1");
}

    while (DataIn > 0){
        while (Serial.available()) {
    // get the new byte:
```

```
char inChar = (char)Serial.read();
if (inChar == '*') {
  DataIn++;

}
if (inChar != '*' && inChar != '#' && DataIn==1) {
  Temp1x+=inChar;

}
if (inChar != '*' && inChar != '#' && DataIn==2) {
  Temp2x+=inChar;

}
if (inChar != '*' && inChar != '#' && DataIn==3) {
  Temp3x+=inChar;

}
 if (inChar != '*' && inChar != '#' && DataIn==4) {
  Temp4x+=inChar;

}
  if (inChar != '*' && inChar != '#' && DataIn==5) {
  Temp5x+=inChar;

}
  if (inChar != '*' && inChar != '#' && DataIn==6) {
  Temp6x+=inChar;

}
  if (inChar != '*' && inChar != '#' && DataIn==7) {
  Temp7x+=inChar;

}
  if (inChar != '*' && inChar != '#' && DataIn==8) {
  Temp8x+=inChar;

}
  if (inChar != '*' && inChar != '#' && DataIn==9) {
  Temp9x+=inChar;

}
  if (inChar != '*' && inChar != '#' && DataIn==10) {
  Temp10x+=inChar;

}


if (inChar == '#') {
```

```
      DataIn=0;
     Temp1y=Temp1x;   PHy=PHx;      Temp2y=Temp2x;  Temp3y=Temp3x;
 Temp4y=Temp4x;
     Temp5y=Temp5x;
     Temp6y=Temp6x;
     Temp7y=Temp7x;
     Temp8y=Temp8x;
     Temp9y=Temp9x;
     Temp10y=Temp10x;
     Temp1x="";
     PHx="";   Temp2x="";
     Temp3x="";
     Temp4x="";
     Temp5x="";
     Temp6x="";
     Temp7x="";
     Temp8x="";
     Temp9x="";
     Temp10x="";
     Blynk.virtualWrite(V0, Temp1y);



    }
        }

    }

 //*************************************************************************
*****************************************

 //*************************************************************************
*****************************************

}
//-------------------------------------------------
}
```

```
#include <WiFiClientSecureBearSSL.h>
#include <WiFiServer.h>
#include <WiFiServerSecure.h>
#include <WiFiServerSecureBearSSL.h>
#include <WiFiUdp.h>

// Template ID, Device Name and Auth Token are provided by the Blynk.Cloud
// See the Device Info tab, or Template settings
#define BLYNK_TEMPLATE_ID           "TMPLjVLMVoBt"
#define BLYNK_TEMPLATE_NAME         "Quickstart Template"
#define BLYNK_AUTH_TOKEN            "w1_zekUS-Z8yXI00ZTFoMJczIR5llxTu"


// Comment this out to disable prints and save space
#define BLYNK_PRINT Serial


#include <ESP8266WiFi.h>
```

```
utput
Compiling core...
Using precompiled core: C:\Users\Dhisaleny\AppData\Local\Temp\arduino-core-cache\core_89645c7b7354f711605dde4420405f56.a
Linking everything together...
"C:\\Users\\Dhisaleny\\AppData\\Local\\Arduino15\\packages\\esp8266\\tools\\python3\\3.7.2-post1/python3" -I "C:\\Users\\Dhisaleny\\AppData\\L
"C:\\Users\\Dhisaleny\\AppData\\Local\\Arduino15\\packages\\esp8266\\tools\\python3\\3.7.2-post1/python3" -I "C:\\Users\\Dhisaleny\\AppData\\L
"C:\\Users\\Dhisaleny\\AppData\\Local\\Arduino15\\packages\\esp8266\\tools\\xtensa-lx106-elf-gcc\\3.1.0-gcc10.3-e5f9fec/bin/xtensa-lx106-elf-g
"C:\\Users\\Dhisaleny\\AppData\\Local\\Arduino15\\packages\\esp8266\\tools\\xtensa-lx106-elf-gcc\\3.1.0-gcc10.3-e5f9fec/bin/xtensa-lx106-elf-g
"C:\\Users\\Dhisaleny\\AppData\\Local\\Arduino15\\packages\\esp8266\\tools\
"C:\\Users\\Dhisaleny\\AppData\\Local\\Arduino15\\packages\\esp8266\\tools\
Compiling sketch...
```

III APPENDIX C- PROJECT MANUAL/PRODUCT CATALOGUE

KEMENTERIAN PENDIDIKAN MALAYSIA

POLITEKNIK MALAYSIA
UNGKU OMAR

Product specification

Water quality monitoring system device using iot monitor the PH value of wastewater, we generally use PH sensors. The PH sensor is one of a water quality sensor used to monitor the concentration of hydrogen ions in the tested solution and convert it into a corresponding usable output signal to the apps.

The advantages of this machine are:

1. Know about quality water
2. Identify the type of water
3. Can be accessed through the application
4. The pH level of the water

Special features:

The water will be tested by a pH sensor pod and the pH level will be shown on apps sent through the message by Wi-Fi on a smartphone. The apps show pH level, graph parameter of pH level and give suggestion how the water can be filter.

Target user: House people

Instruction Manual

1. Open the data on your phone.
2. Connect the water quality monitoring device in power bank.
3. When the device on, open the pH level apps see that it online or not.
4. After connect, test the device using the sample that you have.
5. It will show you the pH parameter level of the water, type water and give suggestion.

Precaution:

1. When the sensor is initial use or used again after a long-term storage, the electrode port should be immersed in deionized water for 8 hours for activation.

2. The sensor tip should be kept clean.

3. The sensor should be avoided long term immersion in acid fluoride solution.

4. The parts in contact with the sample are material of ABS, silicone rubber and glass. Please confirm that your solution is not harmful to the above materials before measuring the sample.

5. The sensor electrode end should be kept clean during long-term storage and put back in the box and stored at room temperature.

Safety Precaution:

- ✓ Make sure the user's hands are dry and clean before use.
- ✓ Make sure the device is kept away from children when there are in use.