DHIRAJLAL GANDHI COLLEGE OF TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A Project Report

On

"Real-time River Water Quality Monitoring And Control Systems"

Team Id:PNT2022TMID29879
Batch:B1-1M3E

Team Leader :T.Divya
Team Members:M.Jeevajothi
M.Madhu Sowndharya
M.Bhoshika

13.APPENDIX

13.1 Source Code

13.2 GitHub & Project Demo Link

ABSTRACT

This paper deals with the system that is developed to measure the parameters of water such as turbidity, dissolved solvents, pH and temperature. The contamination level of water has been determined by comparing the obtained parameters with their respective ideal ranges. The sensors are interfaced with Arduino UNO and Raspberry Pi for data processing and transmission. The system is designed to float on the water body there by transmitting the measured data trough Wi-Fi to the remote place. The developed water quality monitoring system requires 17 Watts of on-board power and takes 8sec of time for complete processing of one set of data.Agricultural chemicals include fertilizers (nitrogen and phosphorus) and biocides (herbicides, fungicides and insecticides). Environmental impacts in surface waters include algal blooms and disruption to ecological function. Strategies for protection of rivers from eutrophication include improved agricultural land management, conservation farming methods, recycling or retention of drainage and runoff water.The treatment processes were studied using ultrasonic frequencies; 20, 40 and 60 KHz at different time intervals namely 15, 30, 45 and 60 minutes. The study revealed that removal percentage of Total Coliform, Faecal Coliform and Faecal Streptococcus ranged between 5% - 46%. There was a positive correlation between ultrasonic intensity, sonication time and bacterial removal. There are clear morphological changes in the algal organisms without cell disruption especially green algae due to the release of photosynthetic pigments “Chlorophyll”. No changes of chlorophyll “a” content were detected. Pretreated samples with 20, 40, and 60 KHz ultrasonic frequencies for 60 min decreased the alum dose by 6.7 %, 13.3 % and 20 % respectively.

Keywords: Temperature Sensors, pH Sensor, Turbidity Sensor, ArduinoUno, Raspberry Pi,Web UI,Ultrasonic frequencies.

Chapter-1

Introduction

1.1 Project overview

In today's world water is an essential resource without which we cannot live without, hence it can be said that water is a critical resource in the lives of people who both will have benefits from its use and who are harmed by its misuse and unpredictability (flooding, droughts, salinity, acidity, and degraded quality). Water pollution is one of the biggest fears for the green globalization. In order to ensure the safe supply of the drinking water the quality needs to be monitored in real time.

In this paper, we depict the design of Wireless Sensor Network that assists to monitor the quality of water with the support of information sensed by the sensors dipped in water. Using different sensors, this system can collect various parameters from water, such as pH, dissolved oxygen, turbidity, conductivity, temperature, and so on. The rapid development of WSN technology provides a novel approach to real-time data acquisition, transmission, and processing. The clients can get ongoing water quality information from far away. Now a day's Internet of things (IoT) is an innovative technological phenomenon. It is shaping today's world and is used in different fields for collecting, monitoring and analysis of data from remote locations. IoT integrated network if everywhere starting from smart cities, smart power grids, and smart supply chain to smart wearable.

Though IoT is still under applied in the field of environment it has huge potential. It can be applied to detect forest fire and early earthquake, reduce air population, monitor snow level, prevent landslide, and avalanche etc. Moreover, it can be implemented in the field of water quality monitoring and controlling system. Water quality monitoring has gained more interest among researchers in this twenty-first century. Numerous works are either done or ongoing in this topic focusing on various aspects of it. The key theme of all the projects was to develop an efficient, cost-effective, real-time water quality monitoring system which will integrate wireless sensor network and internet of things. In this research, we monitor the physical and chemical parameters of water bodies inside Chittagong city by using an IoT based sensor network.

This project is executed by considering all the sensor values from the sensors are appropriately taken. These values contain the parameters of the water sample being tested such as temperature, pH , turbidity , flow etc. The parameters obtained by the sensors can be then checked with an existing database which notes down the requirements for different kinds of impurities to provide the necessary details of the quality of water.

1.2 Purpose

It has been seen that the quality of the water being distributed to most areas has been deteriorating with time as the water sources from where the water is being drawn gets polluted, as well as lapses in the part of civic body responsible for the maintenance of the quality of water. It may also be due to no proper maintenance of the machines which perform the actions necessary to clean or improve the quality of water being distributed to homes. This has been observed to majorly affect the number of water borne-diseases in the city.

- This project works on achieving proper evaluation of the quality of water with respect to some of the most basic parameters i.e. the temperature will be monitored so that the climatic changes don't affect the water.
- The PH will be monitored so that it remain in the most optimal range and is fit for human consumption and prevents the growth of disease causing microbes. The flow of the water is monitored so that there are no disruptions or leaks and also to maintain a specific flow rate which prevents the growth of fungal and small plants in the transport network.
- Finally The turbidity of the water is monitored so that it gives us a measure of the amount of impurities in the water and if needed it can prompt the required action to change r modify the quality of water if its not in the permissible range.
- A major advantage of the system is the real time monitoring of the quality of the water (i.e:-its immediate quality is monitored) which gives us ability to immediately determine if the water is really safe for consumption or not.
- The system provides us the facility to immediately identify the attributes or parameters of water and see if there should be any additional measures taken to clean or improve the quality of the water Water Monitoring System being sent to us.
- This helps us to make clear cut decisions if we need to purchase additional equipment or not, which in turn helps us to save money and time.

Chapter-2

LITERATURE SURVEY

TOPIC [YEAR]	AUTHOR	OBJECTIVES
Water quality monitoring and control for aqua culture based on wireless sensor network [MAR 2019]	**Daudi S. Simbeye**	**The sensor nodes collect the water quality parameters and transmit them to the base station through was computer**
Water Quality Monitoring Systems based on Intelligent Agents[MAY 2020]	**Adrian Vázquez Osorio, Carlos Armando Soto Barrera**	**Intelligent agents software system used for monitoring**
Iot based real time river water quality monitoring system[OCT 2019]	**Abhijit Pathak**	**Wireless sensor network and microcontroller monitoring system is used**
IOT based real time river quality water monitoring system[AUG 2019]	**Talha bin emran**	**Proposes a senor based monitoring system**
Water monitoring system using testing samples[FEB 2018]	**Shiramshetty Goudamin**	**It is developed for testing water samples and data is uploaded on the internet is analyzed**
Real time water quality monitoring through IOT (A case study on river krishna)[2019]	**Prasad m.pujar**	**To develop the statistical model based on iot for water quality analysis of river krishna**

2.1 Existing Problem

In the current system, water sample is taken from the source and examined in the laboratory manually to measure the specifications required (Water Level, impurities, PH variations and Detection of Bacteria - Water wastage and Purity of water).

Existing system has a mechanisms which are semi-automated or manually controlled devices which are to be handled by a person responsible for monitoring the water quality. There is need to have human intervention in taking various reading of the water parameters.

2.2 References

https://www.researchgate.net/publication/333642226_IoT_Based_Real-time_River_Water_Quality_Monitoring_System

https://www.researchgate.net/publication/337049996_Design_and_Development_of_Real-Time_Water_Quality_Monitoring_System
https://www.researchgate.net/publication/262380185_Water_Quality_Monitoring_and_Control_for_Aquaculture_Based_on_Wireless_Sensor_Networks
https://www.researchgate.net/publication/333642226_IoT_Based_Real-time_River_Water_Quality_Monitoring_System
https://www.researchgate.net/publication/340228493_Water_Quality_Monitoring_Systems_Based_on_Intelligent_Agents_A_Systematic_Literature_Review
https://www.sofarocean.com/products/spotter?utm_source=adwords&utm_campaign=Devices_2663319_Iot
https://www.tandfonline.com/doi/full/10.1080/21622515.2021.2013955

2.3 Problem Statement Definition

*Farmers put fertilizers and pesticides on their crop so that they grow better but these fertilizers and pesiticides can be washed through the soil by rain to end up in the rivers

*If the large amount of fertilizers or the farm waste drain into river the concentration of nitrate and phosphate in the water increases considerably algae uses these substances to graw and multiply rapidly turning the water green

*The massive growth of algae called eutrophication,leads to pollution.when the algae die they broken down by the action of bacteria which quickly multiply using up all the oxygen in the water which leads to the death of many animals.

Chapter-3

IDEATION &PROPOSED SOLUTION

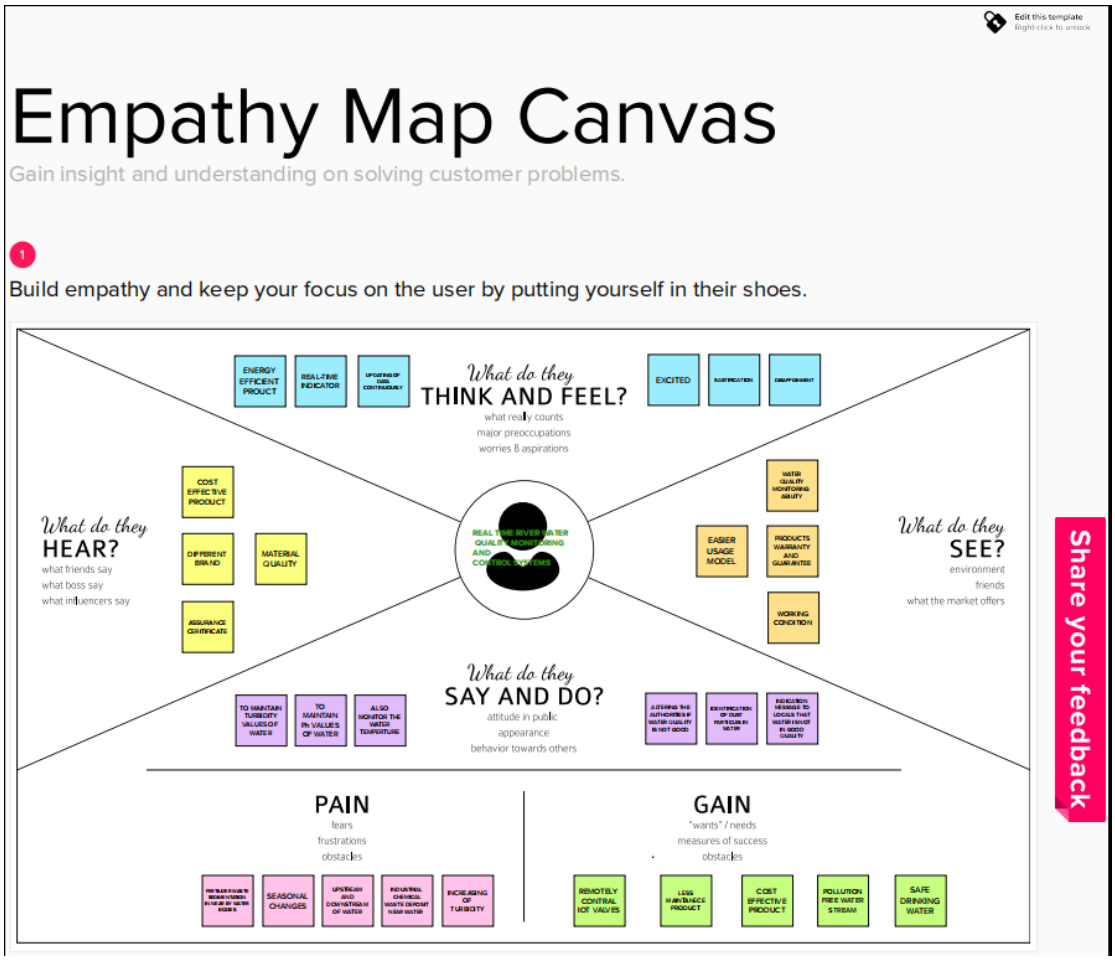
Ideation is the process where you generate ideas and solutions through sessions such as empathy map canvas, ideation and brainstorming. Ideation is also the third stage in the Design Thinking process.

3.1 Empathy Map Canvas

Empathy map consist of six fields,

- **How customer Think and Feel?**
- **How customer See?**
- **How customer Say and Go?**
- **How customer Hear?**

- **What are the advantages,(Gain)the user can get through this model**
- **What are the disadvantages,(pain)the user get through this model**



3.2 Ideation and Brainstorming

Brainstorming is a group problem-solving method that involves the spontaneous contribution of creative ideas and solutions. This technique requires intensive, freewheeling discussion in which every member of the group is encouraged to think aloud and suggest as many ideas as possible based on their diverse knowledge.

Template

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- **10 minutes** to prepare
- **1 hour** to collaborate
- **2-8 people** recommended

Share template feedback

Need some inspiration?

See a finished version of this template to kickstart your work.

Open example →

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A **Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B **Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.

C **Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

MEMBERS OF THE IDEATION PROCESS:

TEAM ID : PTN2022TMID29879
TEAM LEAD :T.DIVYA
TEAM MEMBER 1: M.JEEVAJOTHI
TEAM MEMBER 2:M.MADHU SOWNDHARYA
TEAM MEMBER 3:M.BHOSHIKA

TODAY'S DISCUSSION TOPIC:

Ideas for monitoring and solving the contaminated river water near agriculture fields

1 Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

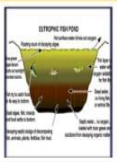
5 minutes

PROBLEM STATEMENT

Farmers put fertilizers and pesticides on their crop so that they grow better but these fertilizers and pesticides can be washed through the soil by rain to end up in the rivers

If the large amount of fertilizers or the farm waste drain into river the concentration of nitrate and phosphate in the water increases considerably algae
uses these substances to grow and multiply rapidly turning the water green

The massive growth of algae called Eutrophication,that leads to pollution.When the algae die they broken down by the action of bacteria which quickly multiply using up all the oxygen in the water which leads to the death of many animal



2 Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP
You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

3 Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

TIP
Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

T.DIVYA

- arduino and sensor based water parameters monitoring
- pH, turbidity ,temperature sensors connected with arudino
- prefixed values in Arduino monitors the quality parameters of river
- GSM modules to collect and transfer water quality data to mobile applications
- GPRS for tracking the location of highly affected algal bloom area
- zigbee network to sensor resultant data
- ultrasonic radiation for algae control
- miniature dams created and clearing algae production before affecting the whole water body

M.JEEVAJOTHI

- identifying of threshold values of pH temperature and turbidity
- measuring device based two nri cameras and image processing
- cloud data based microcontroller node mcu used for water monitoring
- algorithm encryption and decryption datas of pH and turbity of water
- UI web application for water monitoring
- alerting water contamination of algae to locals through Wi-Fi
- biological and chemical changes identification of water by conventional method
- dissolve air floatation methodology for controlling algae

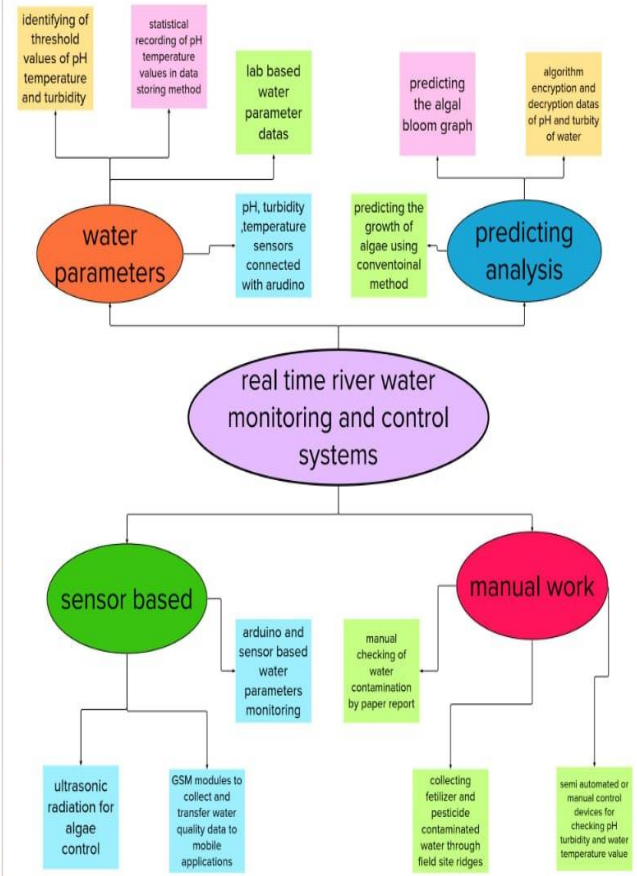
M.MADHU SOWNDHARYA

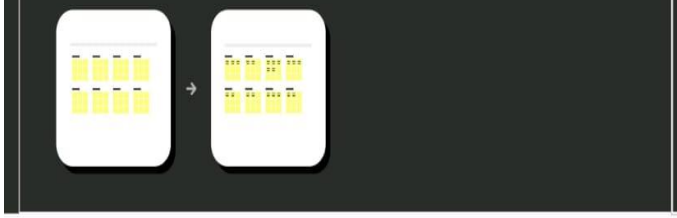
- statistical recording of pH temperature values in data storing method
- app developing for detecting pH ,turbidity and temperature of river water
- predicting the algal bloom graph
- using graph creating database in cloud
- wireless network based water parameter data collection
- forming mesh network using sensor to better monitoring
- ion exchange method after detection
- motor like device for cleaning algae and contains chlorine for clearing algae

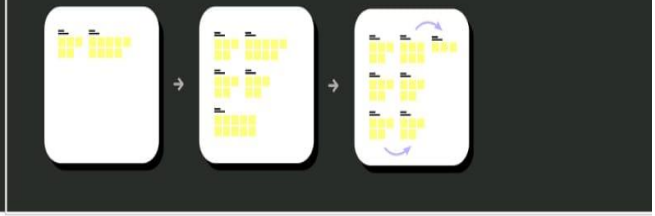
M.BHOSHIKA

- lab based water parameter datas
- semi automated or manual control devices for checking pH turbidity and water temperature value
- hydrophonics and aquaphonics technology for pH indicator
- nephelometer for turbidity measurement
- collecting fetilizer and pesticide contaminated water through field site ridges
- predicting the growth of algae using conventoinal method
- biotreatment for contaminated water
- manual checking of water contamination by paper report

Group ideas







4

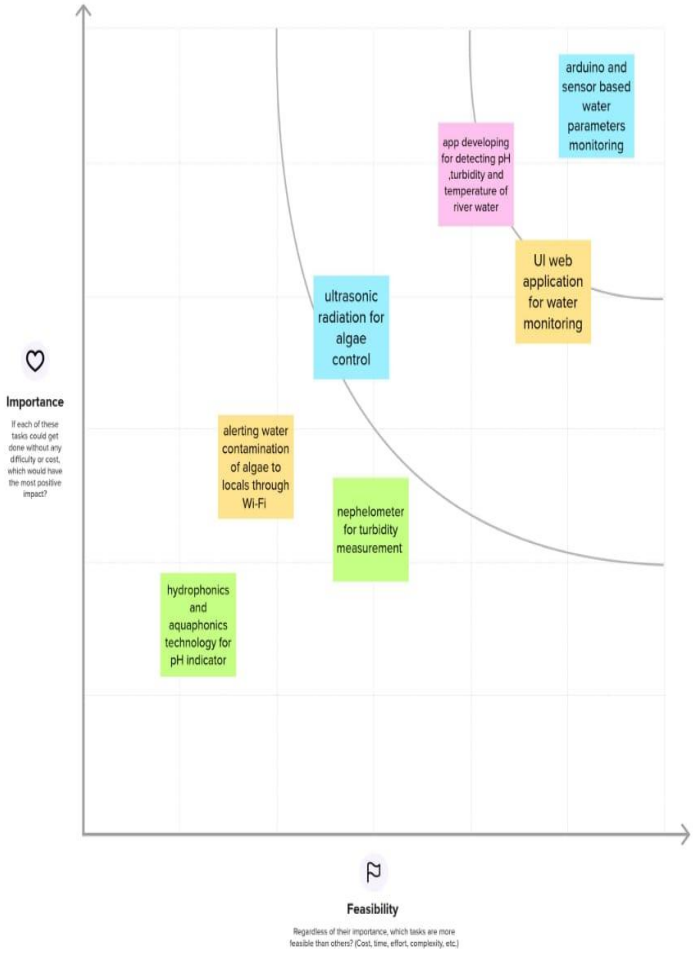
Prioritize

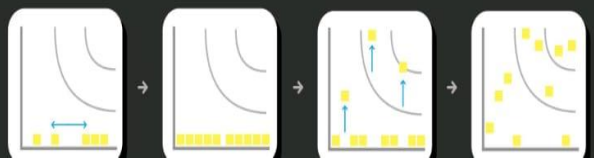
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

TIP

Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the **H key** on the keyboard.





After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

A **Share the mural**
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

B **Export the mural**
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.
Open the template →

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template →

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template →

Share template feedback

3.3 Proposed Solution

*Proposed Solution means the technical solution to be provided by the Implementation agency in response to the requirements and the objectives of the Project.

Date	24 September 2022
Team ID	PNT2022TMID29879
Project Name	Project – Real Time River Water Quality Monitoring and Control System
Maximum Marks	2 Marks

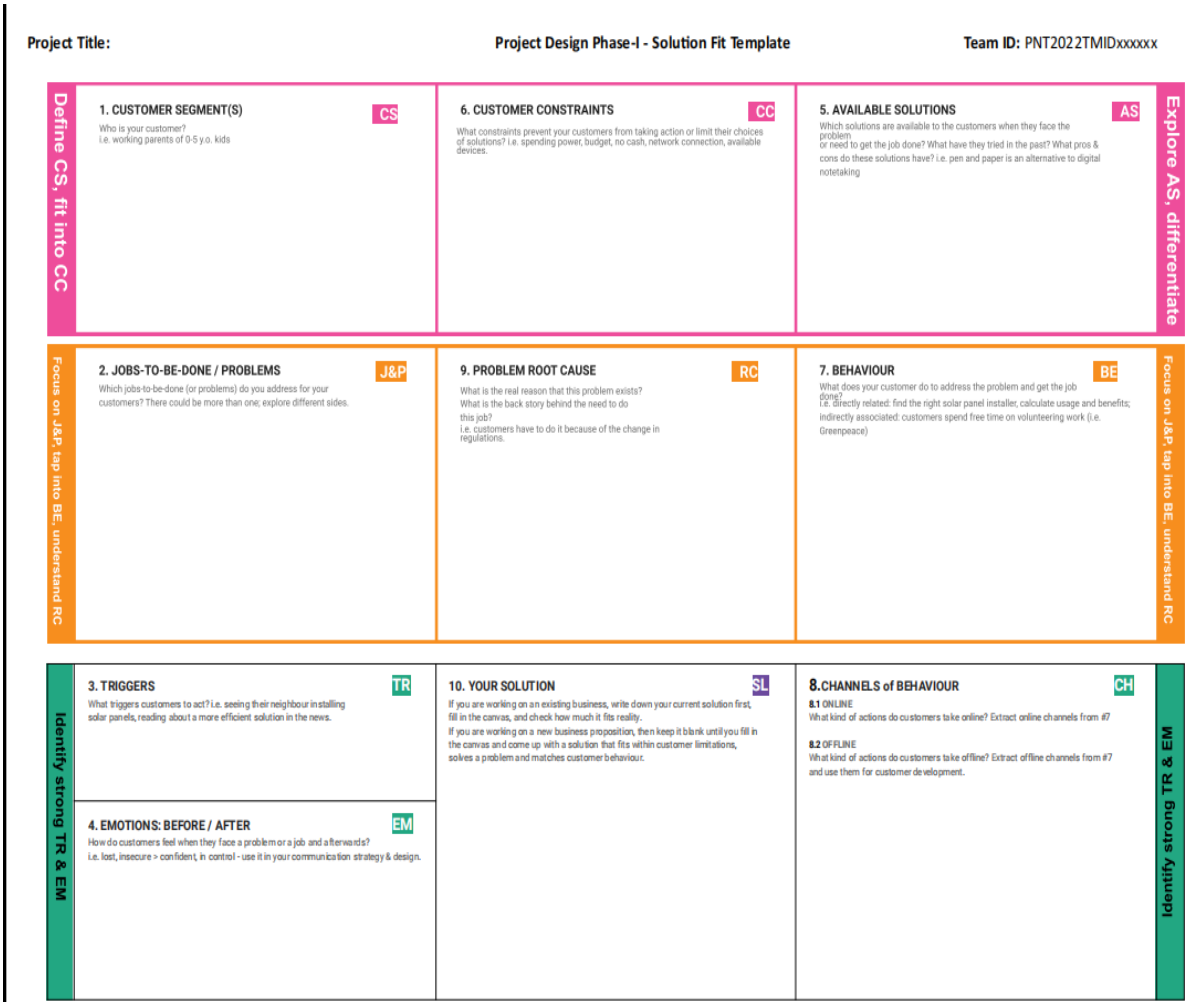
Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To Control the Algal bloom and monitor the water parameters such as ph,turbidity and dissolved solvents.
2.	Idea / Solution description	Monitoring water parameters by using Arduino and Sensors and control measures by ultrasonic frequency.
3.	Novelty / Uniqueness	Controlling Algal Blooms using Ultrasonic frequencies.
4.	Social Impact / Customer Satisfaction	People come to know about the quality of water.
5.	Business Model (Revenue Model)	Water Monitoring and Control Model.
6.	Scalability of the Solution	The process of operating this Model is very easy.

3.4 Problem solution fit

*The Problem-Solution Fit simply means that **you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem.**



Chapter-4

REQUIREMENT ANALYSIS

4.1 Functional requirements

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through product mobile UI
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Ph level detection	Ph sensor is used to detect and signals send to Arudino .This sends SMS to mobile UI
FR-4	Turbidity detection	Turbidity sensor is used to detect and signals send to Arudino.This sends SMS via mobile UI
FR-5	Ultrasonic generator	Waves generated at regular interval times to clear algae 25% ,50%, 100%

4.2 Non-functional requirements

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Efficient to use and has simple monitoring system.
NFR-2	**Security**	Mobile application is secured with firewalls protection
NFR-3	**Reliability**	Real time sensor output values with future predicted data storage.98% efficient monitoring output and 100% clearance of algae production.Assurance for aquaculture safety
NFR-4	**Performance**	Greater performance and environmental safe model
NFR-5	**Availability**	In form of mobile UI 24 x 7 monitoring system
NFR-6	**Scalability**	Highly Scalable.It is capable to produce a best final output.

Chapter-5

PROJECT DESIGN

*Project design is an early phase of the project life cycle where ideas processes, resources, and deliverables are planned out.

5.1 Data flow diagrams

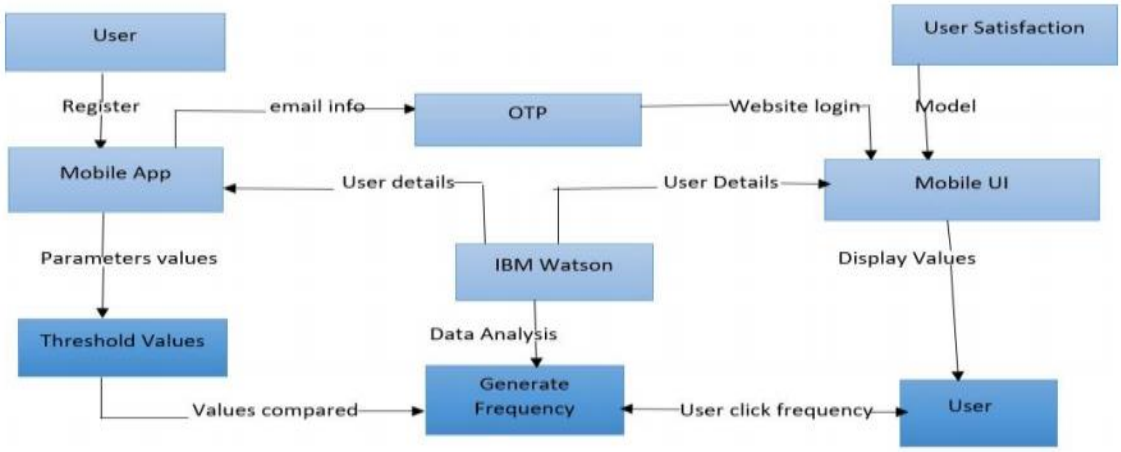
*A data flow diagram is a graphical or visual representation using a standardized set of symbols and notations to describe a business's operations through data movement.

*. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Project Design Phase-II
Data Flow Diagram & User Stories

Date	16 October 2022
Team ID	PNT2022TMID29879
Project Name	Real-Time River Water Quality Monitoring and Control System
Maximum Marks	4 Marks

Data Flow Diagrams:



5.2Solution and Technical architecture

*Solution architecture is a practice to provide ground for software development projects by tailoring IT solutions to specific business needs and defining their functional requirements and stages of implementation. It is comprised of many subprocesses that draw guidance from various enterprise architecture viewpoints.

*Technical Architecture is a form of IT architecture that is used to design computer systems. It involves the development of a technical blueprint with regard to the arrangement, interaction, and interdependence of all elements so that system-relevant requirements are met.

Project Design Phase-I
Solution Architecture

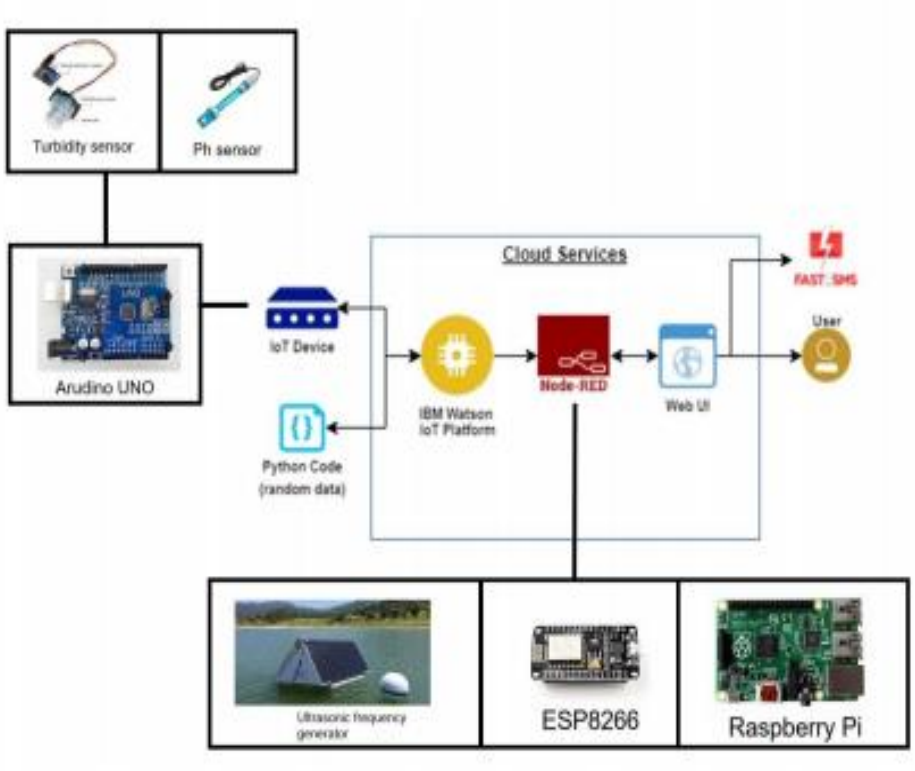
Date	16 September 2022
Team ID	PNT2022TMID29879
Project Name	Real Time River Water Quality Monitoring and Control systems
Maximum Marks	4 Marks

Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

Solution Architecture Diagram:



Technical Architecture:

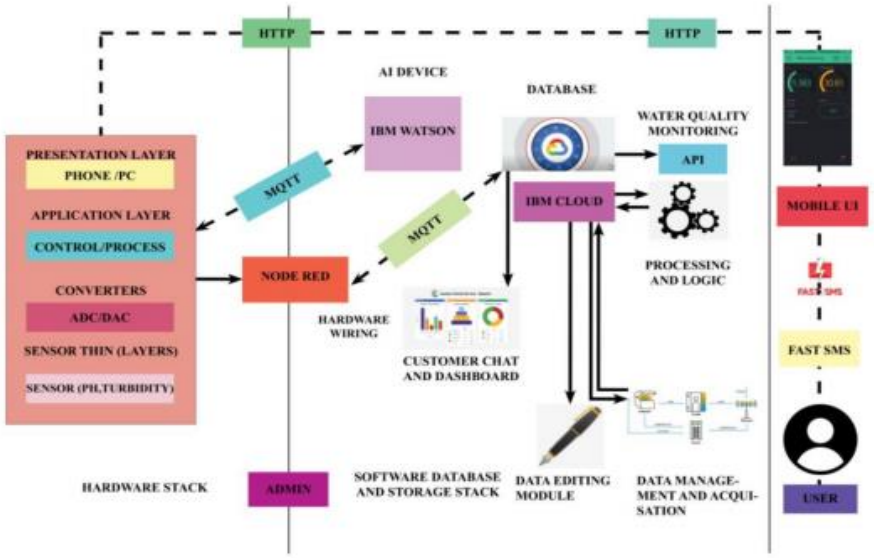


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Mobile UI	HTML, CSS, java script
2.	Application Logic-1(mobile application)	Scale meter is introduced to monitor the water parameters	Java
3.	Application Logic-2(AI Application)	For predicting future values of water quality range	IBM Watson Assistant
4.	Database	Data Type	NOSQL.
5.	Cloud Database	Database Service on Cloud	IBM Cloudant
6.	File Storage	File storage requirements: Container Platform Version 4.6	IBM Block Storage
7.	External API-1	The data is used to compare the values for sensor with threshold values	IBM water quality API
8.	External API-2	For the locals and authorities to know the water quality	mobile API,
9.	Machine Learning Model(node-red)	For interfacing hardware and software application(a virtual wiring tool)	Platform: Node.js
10.	Infrastructure (Server / Cloud)	Application Deployment on cloud Cloud Server Configuration : application-client-bnd	IBM cloud

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	**Bootstrap**	CSS
2.	Security Implementations	MQTT,CoAP,DTLS,6LoWPAN	Encryptions, OWASP
3.	Scalable Architecture	The scalability of architecture (3 – tier)	IOT and mobile application
4.	Availability	Distributed servers	IBM cloud and Watson
5.	Performance	Use of cache,better performance	Fast SMS application

5.3 User Stories

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for Mobile UI by entering my user details.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive OTP from email once I have registered for the Mobile App	I can receive OTP & Enter confirm	High	Sprint-1
		USN-3	As a user, I can see the parameters in the mobile app UI	I can Analysis all the details	Medium	Sprint-2
		USN-4	As a user, I can click the frequency to control the water quality		Medium	Sprint-1
	Login	USN-5	As a user, I can monitor the water quality		High	Sprint-1
	Dashboard					
Customer Care Executive	Via calling	USN	On calling company's customer care center	Accepted by faster response	High	Sprint 4
Administrator	Registration	USN	By personalized setting of products	Accepted	High	Sprint-3

Chapter-6

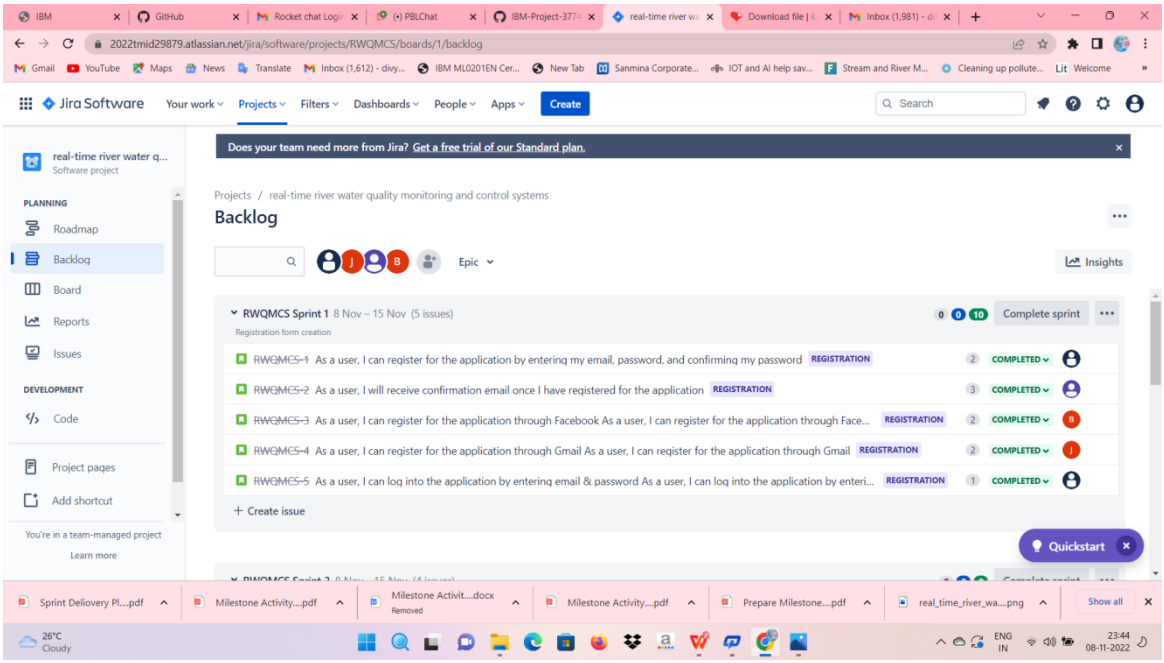
PROJECT PLANNING AND SCHEDULING

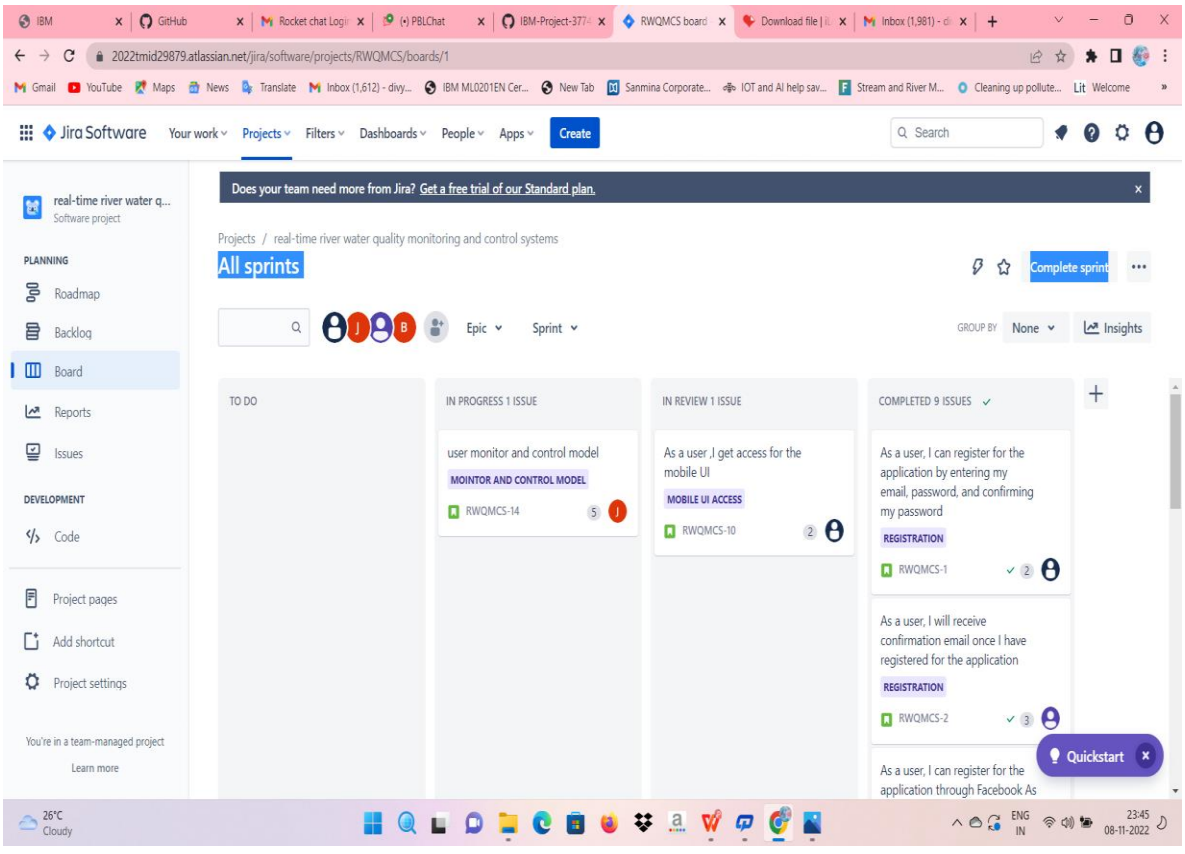
6.1 Sprint Planning & Estimation

*Sprint planning is **an event in scrum that kicks off the sprint**. The purpose of sprint planning is to define what can be delivered in the sprint and how that work will be achieved. Sprint planning is done in collaboration with the whole scrum team.

*The deliverables of a sprint aren't as predictable as they are for other projects. Sprint participants have produced **sketches and drawings, writing, photographs, comic strips, videos and fully coded working prototypes**. The answer is what ever's right to answer the problem.

6.2 Sprint Delivery Schedule





Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	T.Divya
Sprint-1	Registration	USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	M.Madhu
Sprint-1	Registration	USN-3	As a user, I can register for the application through Facebook	2	Low	M.Bhoshika
Sprint-1	Registration	USN-4	As a user, I can register for the application through Gmail	2	Medium	M.Jeevajothi
Sprint-1	Registration	USN-5	As a user, I can log into the application by entering email & password	1	low	T.Divya
Sprint-2	Login	USN-1	As a user I need to register for that mobile UI access	3	High	M.Madhu
Sprint-2	Login	USN-6	As a user I will have mobile UI to access the product	2	Medium	M.Bhoshika
Sprint-2	Login	USN-2	As a product user ,I get OTP for verification	3	High	M.Jeevajothi
Sprint-2	Login	USN-3	As a user ,I get access for the mobile UI	2	Medium	T.Divya
Sprint-3	Dashboard	USN-7	dashboard for cloud API	5	High	T.Divya
Sprint-4	Model delivery	USN-8	user monitor and control model	5	High	M.Jeevajothi

Project Tracker, Velocity & Burndown Chart: (4 Marks)

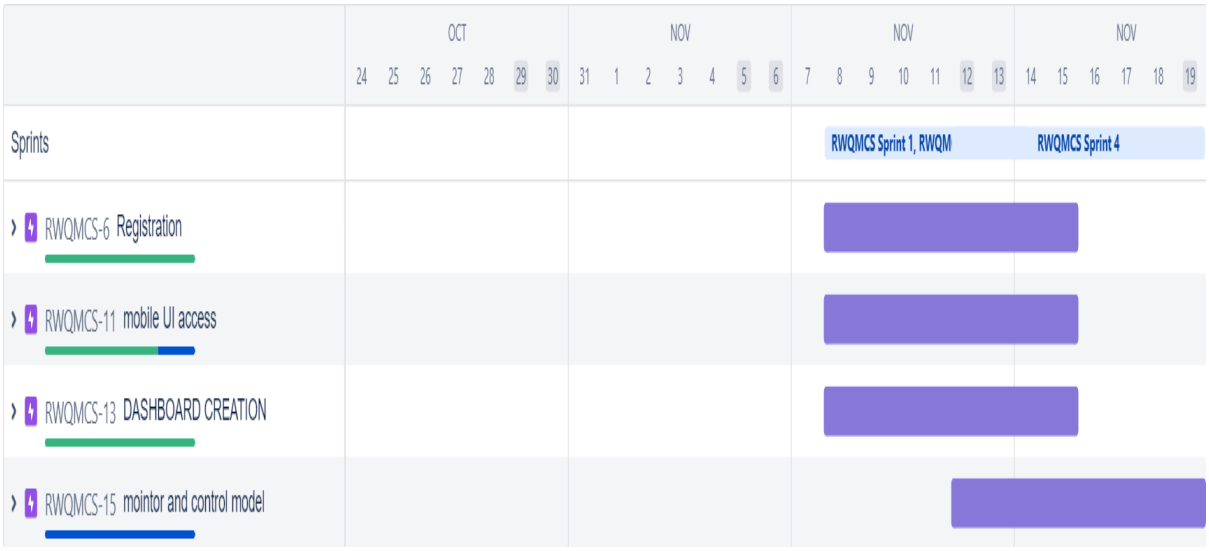
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	10	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	5	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	5	19 Nov 2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

6.3 Reports from JIRA



Chapter-7

CODING & SOLUTIONING

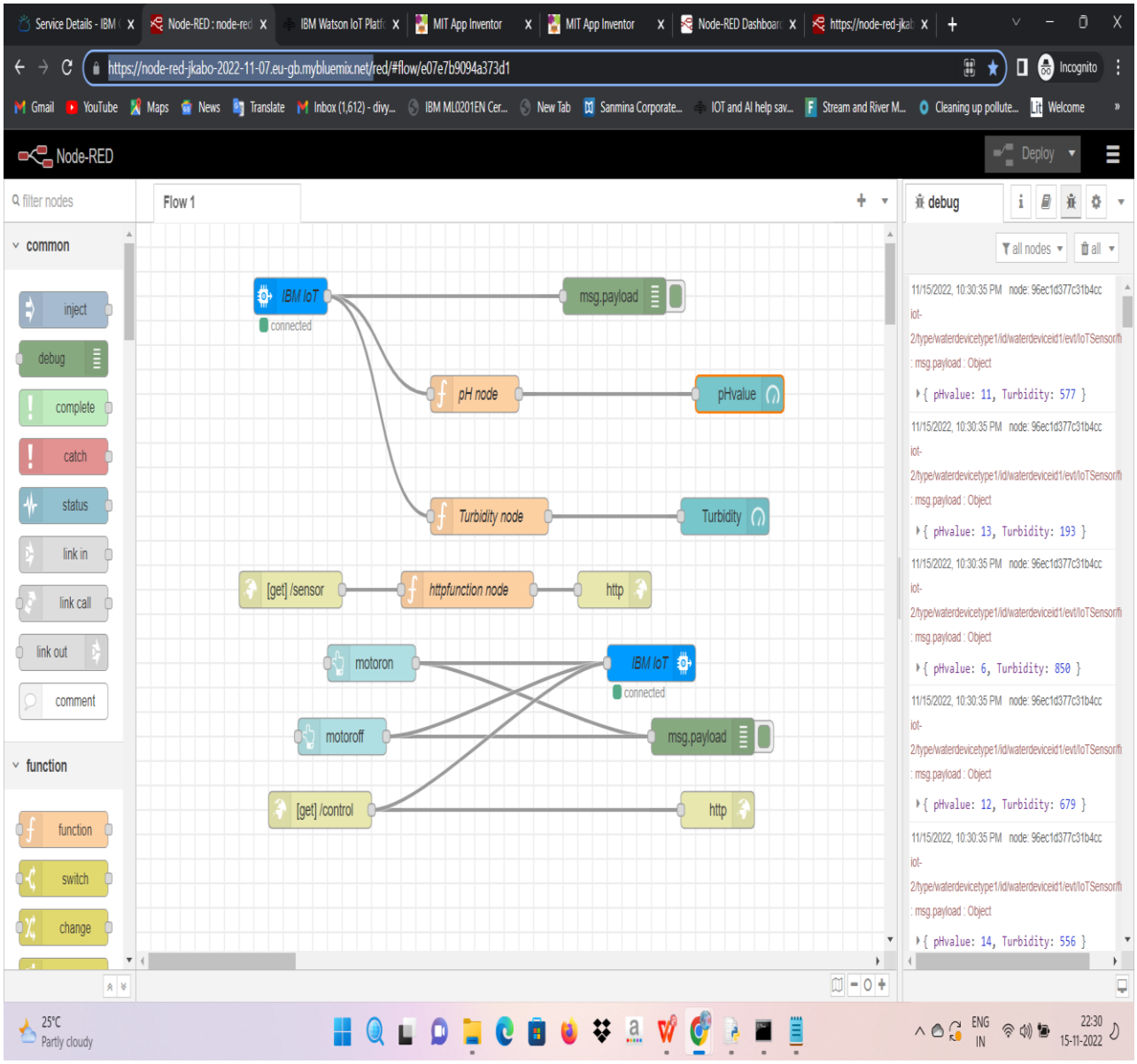
7.1 Feature 1

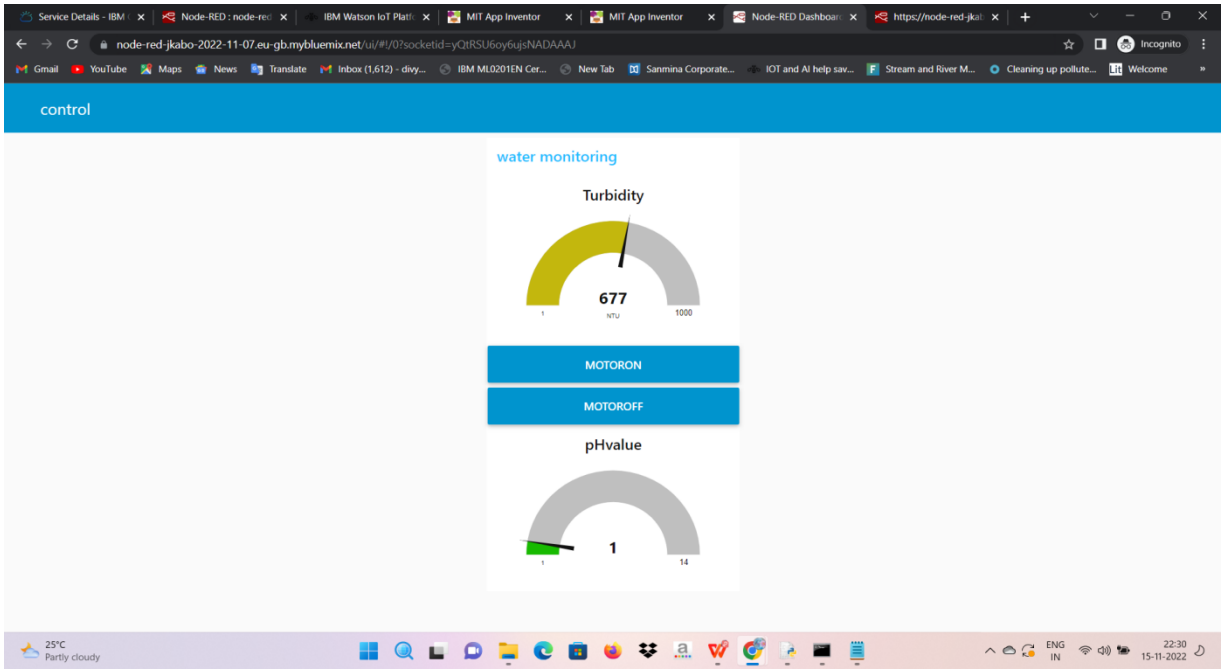
- IOT device
- IBM Watson Platform
- Node Red
- Cloudant Data Base
- Web UI
- MIT App Inverter
- Python code

7.2Feature 2

- Registration
- Login

NODE RED SERVICE ASSOCIATED WITH IBM CLOUD:





Chapter-8

TESTING

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the Real time river water monitoring and control system project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

Test case ID	Test Scenario	Pre-Requisite	Result	Executed By
Registration page	Verify user is able to see the registration when user clicked on My account button	HTML Code,PHP, SQL	WORKING	T.DIVYA
Login page	Verify user is able to see the login when user clicked on My account button	PHP SQL LOCAL SERVER	WORKING	M. MADHU N. SOWNDHARYA
IOT sensor device	User able to use the devices	IBM CLOUD,IBM WATSON,NODE RED	WORKING	M.JEEVAJOTHI

Mobile user interface	User able to use my mobile interface	MIT APP INVENTOR	WORKING	M.BHOSHIKA

3. Test Case Analysis

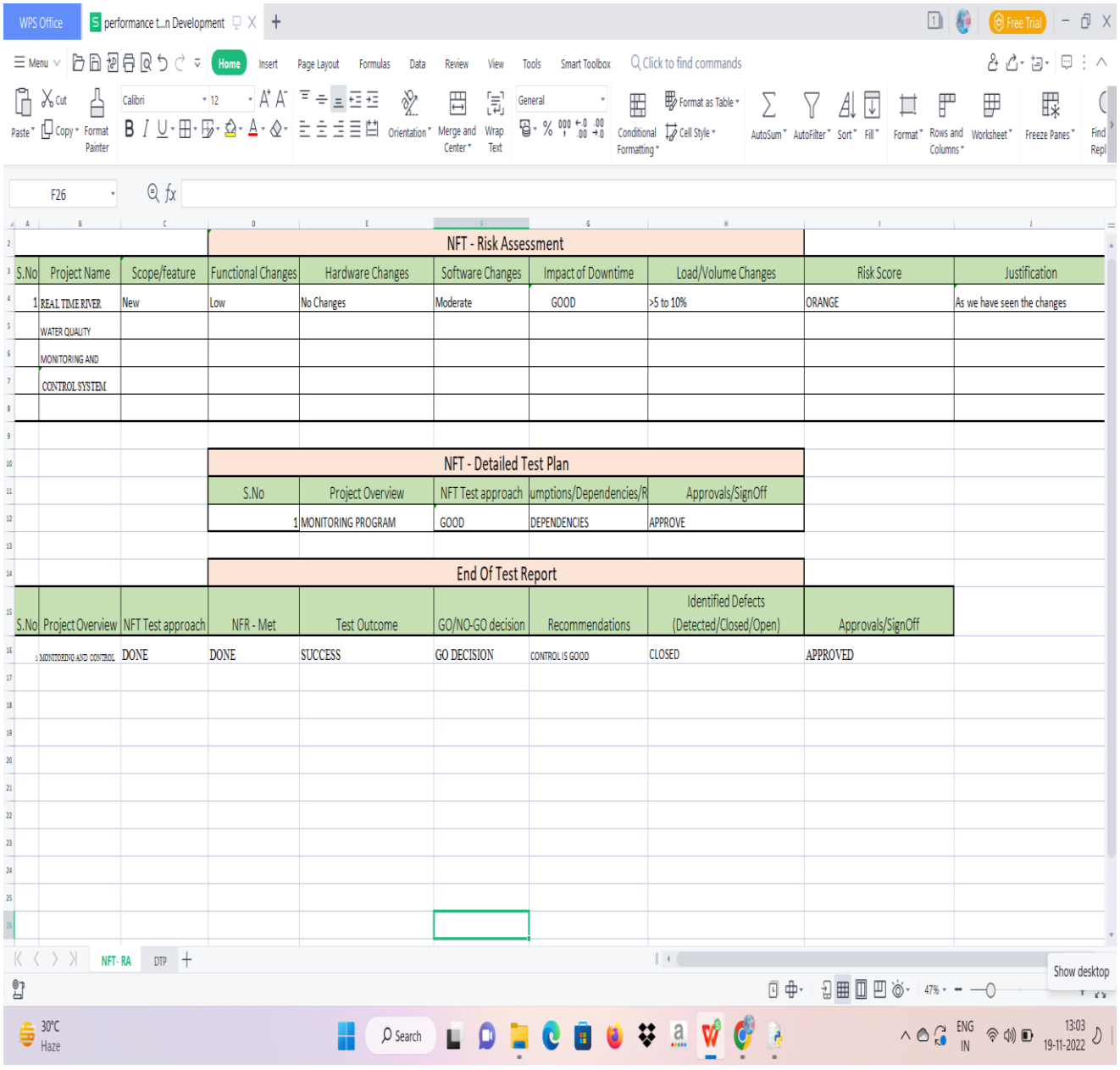
This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

Chapter-9

RESULT

9.1 PERFROMANCE METRICS:



NFT - Risk Assessment

S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Volume Changes	Risk Score	Justification
1	REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM	New	Low	No Changes	Moderate	GOOD	>5 to 10%	ORANGE	As we have seen the changes

NFT - Detailed Test Plan

S.No	Project Overview	NFT Test approach	umptions/Dependencies/R	Approvals/SignOff
1	MONITORING PROGRAM	GOOD	DEPENDENCIES	APPROVE

End Of Test Report

S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	GO/NO-GO decision	Recommendations	Identified Defects (Detected/Closed/Open)	Approvals/SignOff
1	MONITORING AND CONTROL	DONE	DONE	SUCCESS	GO DECISION	CONTROL IS GOOD	CLOSED	APPROVED

PERFORMANCE TABLE

PARAMETER	PERFORMANCE	DESCRIPTION
ADMIN TESTING	95%-100%	THE TESTING DONE BEFORE IT IS DEPLOYED AS AN APP
CUSTOMER SATISFACTION	75-85%	THE CUSTOMER NEED TO BE SATISFIED WITH THE MOBILE APPLICATION
USER INTERFACE	65-85%	THE APP CAN USED BY ANYONE.(EASE OF ACCESS)
SEVER RESPONSE	50-75%	url - response
DATA VALIDATION WITH NO. OF TEST CASE	60-80% (10-12 TESTCASE)	VALID DATA FROM THE APP
ERROR	5-7%	REAL-TIME DELAY MAY OCCUR

Chapter-10

10. ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

● The prototype developed for water quality maintenance is very beneficial for safeguarding public health and also adds to the clean environment.
● The automation of this water monitoring, cleaning and control process removes the need of manual labor and thus saves time

and money.

● The automation of the system makes the control and monitoring process more efficient and effective. Real time monitoring on mobile phone which is possible through the interface of plc with Arduino and Bluetooth module allows remote controlling of the system.

DISADVANTAGES:

● It is difficult to collect the water samples from all the area of the water body.

● The cost of analysis is very high.

● The lab testing and analysis takes some time and hence the lab results does not reflect real time water quality measurement due to delay in measurement.

● The process is time consuming due to slow process of manual data collection from different locations of the water body.

● The method is prone to human errors of various forms.

Chapter-11

11. CONCLUSION

Thus our project is used to Monitoring of Turbidity, PH & Temperature of Water makes use of water detection sensor with unique advantage and existing GSM network. The system can monitor water quality automatically, and it is low in cost and does not require people on duty. So the water quality testing is likely to be more economical, convenient and fast. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters. The operation is simple. The system can be expanded to monitor hydrologic, air pollution, industrial and agricultural production and so on. It has widespread application and extension value.By

keeping the embedded devices in the environment for monitoring enables self protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network. Then the collected data and analysis results will be available to the end user through the Wi-Fi.

Chapter-12

FUTURE SCOPE

We use water detection sensor has unique advantage.It consumes less time to monitor than a manual method for checking polluted levels,and notifies immediately to reduce affected rate of pollution in water.People who are living in rural areas near to the river will be very satisfied with our idea.It will be useful to monitor water pollution in specific area.So this system prevent people from water pollution.It will be used for farming purpose to check quality water,temperature and PH level.Our Impact of this project is also create a social satisfaction for farmers too.The scalabilty of this project gives the addition of more different type of sensors.By interfacing the relay we can control the supply of water. We can also implement as a revenue model.This system could also be implemented in various industrial processes. The system can be modified according to the needs of the user and can be implemented along with lab view to monitor data on computers.

Chapter-13

APPENDIX

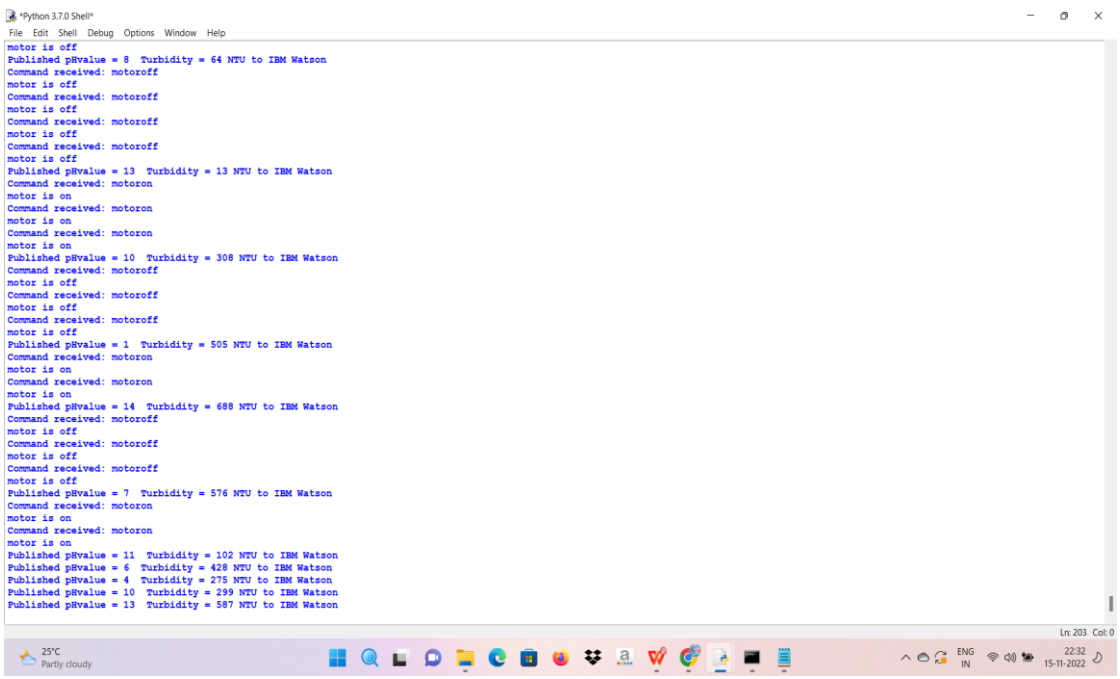
13.1 SOURCE CODE:

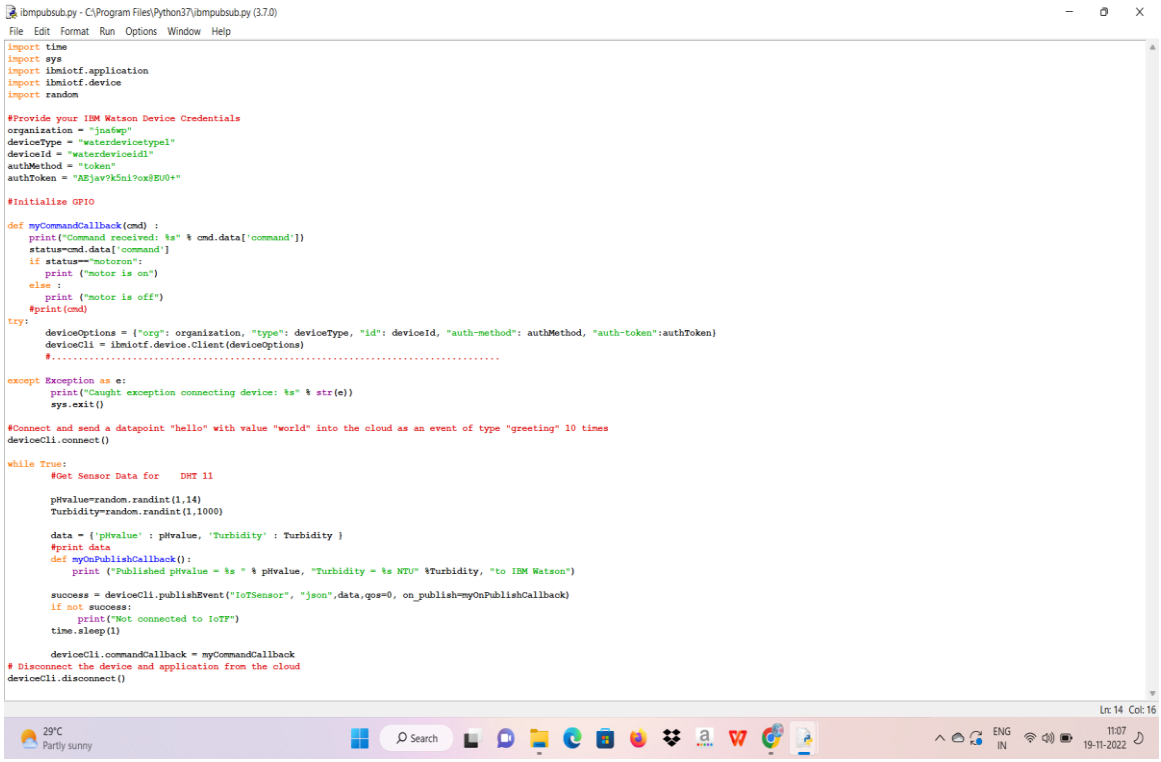
PYTHON CODE TO PUBLISH DATA

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random

#Provide your IBM Watson Device Credentials
organization = "jna6wp"
deviceType = "waterdevicetype1"
deviceId = "waterdeviceid1"
authMethod = "token"
authToken = "AEjav?k5ni?ox@EU0+"

#Initialize GPIO

def myCommandCallback(cmd) :
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="motoron":
      print ("motor is on")
    else :
      print ("motor is off")
    #print(cmd)
try:
      deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-
method": authMethod, "auth-token":authToken}
      deviceCli = ibmiotf.device.Client(deviceOptions)
      #.....

except Exception as e:
       print("Caught exception connecting device: %s" % str(e))
       sys.exit()

#Connect and send a datapoint "hello" with value "world" into the cloud as an event
of type "greeting" 10 times
deviceCli.connect()

while True:
       #Get Sensor Data for DHT 11

       pHvalue=random.randint(1,14)
       Turbidity=random.randint(1,1000)
```

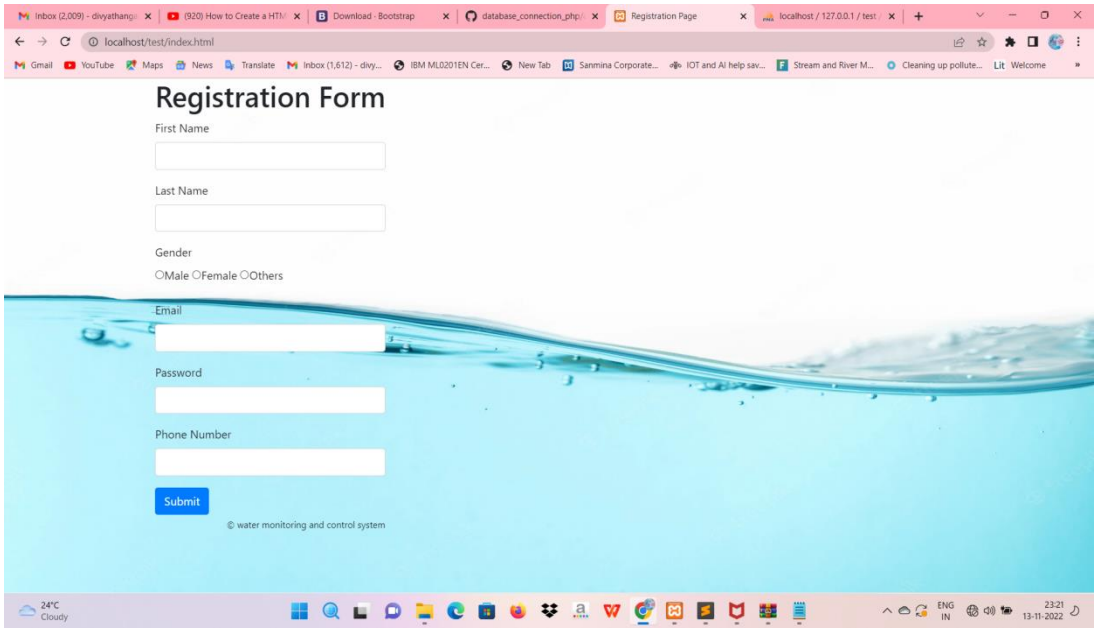
```
        data = {'pHvalue' : pHvalue, 'Turbidity' : Turbidity }
        #print data
        def myOnPublishCallback():
            print ("Published pHvalue = %s " % pHvalue, "Turbidity = %s NTU" %Turbidity, "to IBM Watson")

        success = deviceCli.publishEvent("IoTSensor", "json",data,qos=0, on_publish=myOnPublishCallback)
        if not success:
            print("Not connected to IoTF")
        time.sleep(1)

        deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

Output

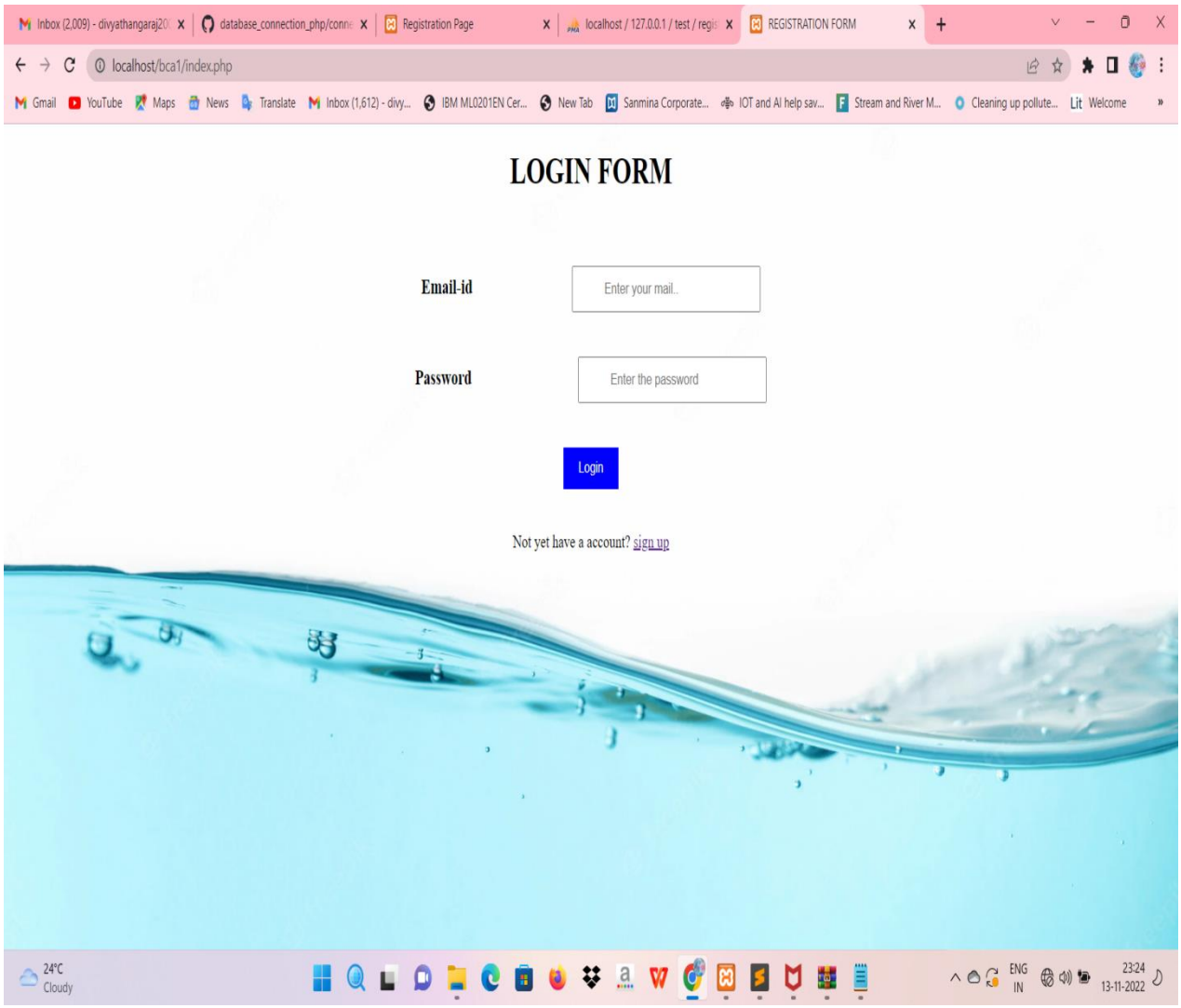


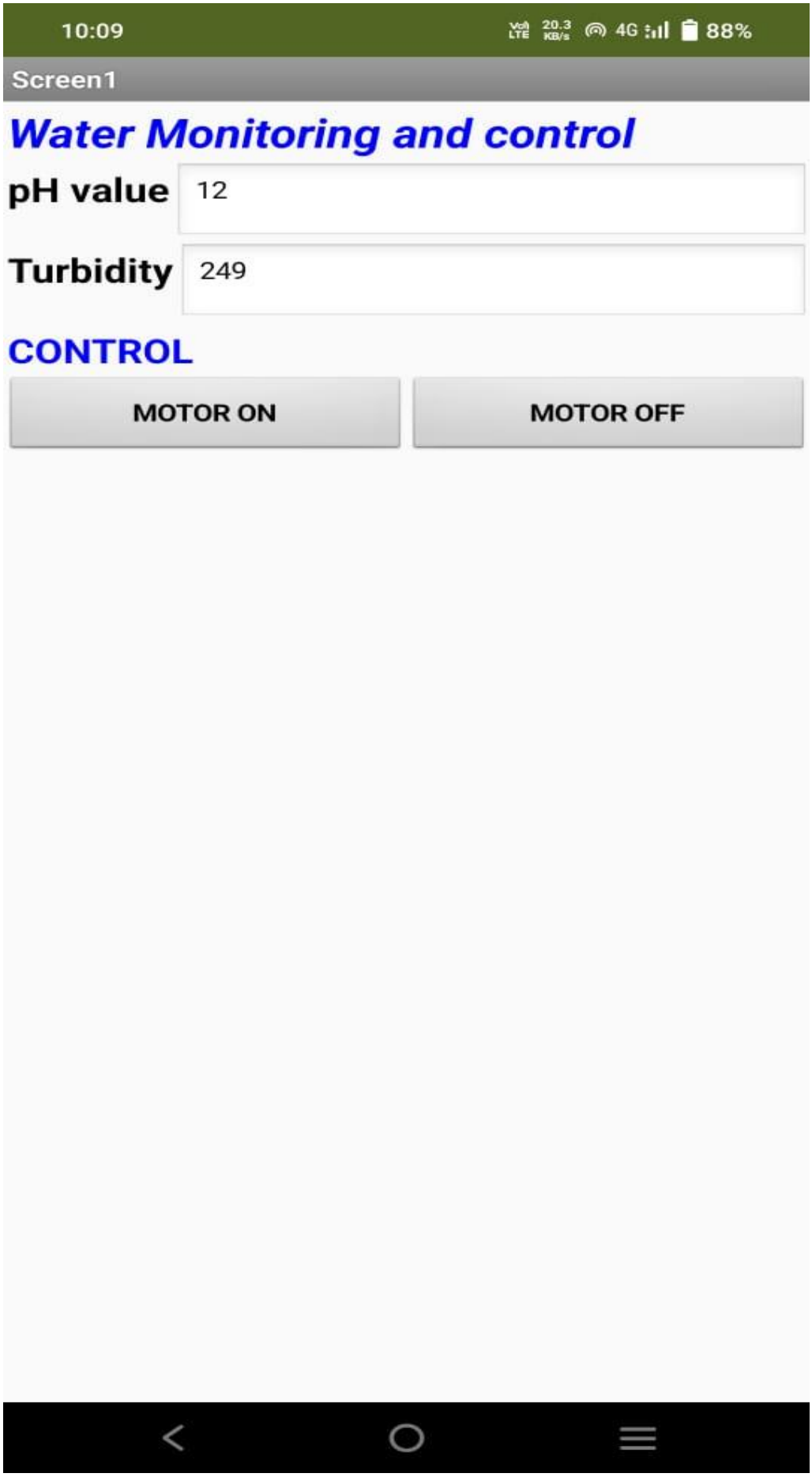

ibmpubsub.py - C:\Program Files\Python37\ibmpubsub.py (3.7.0)
File Edit Format Run Options Window Help
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
#Provide your IBM Watson Device Credentials
organization = "jna6wp"
deviceType = "waterdevicetype1"
deviceId = "waterdeviceid1"
authMethod = "token"
authToken = "AEjav?k5n1?ox@EU0+"
#Initialize GPIO
def myCommandCallback(cmd) :
print("Command received: %s" % cmd.data['command'])
status=cmd.data['command']
if status=="motoron":
print ("motor is on")
else :
print ("motor is off")
#print(cmd)
try:
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method": authMethod, "auth-token":authToken}
deviceCli = ibmiotf.device.Client(deviceOptions)
#.....
except Exception as e:
print("Caught exception connecting device: %s" % str(e))
sys.exit()
#Connect and send a datapoint "hello" with value "world" into the cloud as an event of type "greeting" 10 times
deviceCli.connect()
while True:
#Get Sensor Data from DHT 11
pHvalue=random.randint(1,14)
Turbidity=random.randint(1,1000)
data = {'pHvalue' : pHvalue, 'Turbidity' : Turbidity }
#print data
def myOnPublishCallback():
print ("Published pHvalue = %s " % pHvalue, "Turbidity = %s NTU" %Turbidity, "to IBM Watson")
success = deviceCli.publishEvent("IoTSensor", "json",data,qos=0, on_publish=myOnPublishCallback)
if not success:
print("Not connected to IoTF")
time.sleep(1)
deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
deviceCli.disconnect()
Ln: 14 Col: 16
29°C
Partly sunny
Search
ENG
IN
11:07
19-11-2022

Mobile App


localhost/test/index.html
Registration Form
First Name
Last Name
Gender
Male Female Others
Email
Password
Phone Number
Submit
© water monitoring and control system
24°C
Cloudy
ENG
IN
23:21
13-11-2022

Login Form


LOGIN FORM
Email-id
Enter your mail..
Password
Enter the password
Login
Not yet have a account? sign up


10:09
20.3 KB/s
4G
88%
Screen1
Water Monitoring and control
pH value
12
Turbidity
249
CONTROL
MOTOR ON
MOTOR OFF

13.2 GIT-HUB LINK:

- https://github.com/IBM-EPBL/IBM-Project-31413-1660200246

- https://node-red-jkabo-2022-11-07.eu-gb.mybluemix.net/red/#flow/e07e7b9094a373d1

- https://jna6wp.internetofthings.ibmcloud.com/dashboard/devices/browse