BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

EEE 304 (July 2022) **C2**
Digital Electronics Laboratory

Final Project Report

WATER LEVEL INDICATOR USING 74 SERIES IC and 7 SEGMENT DISPLAY

Ethics Statement:

"In signing this statement, We hereby certify that the work on this project is our own and that we have not copied the work of any other students (past or present), or copied from internet. We have cited all relevant sources while completing this project. We understand that if we fail to honor this agreement, We will each receive a score of ZERO for this project and be subject to failure of this course."

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Evaluation Form:

STEP	Assessment Tool	Criteria	CO	PO	MAX	SCORE
1	Peer Assessment	Individual Contribution	CO5	PO9	10	
2		Teamwork	CO5	PO9	10	
3		Ethics	CO4	PO8	10	
4	Viva	Ethics	CO4	PO8	10	
5		Tool Usage	CO2	PO5	10	
6	Report	Technological Limit Evaluation	CO2	PO5	10	
7		Technical Details	CO6	PO10	10	
8		Design Considerations	CO3	PO3	10	
9	Project Demonstration		CO3	PO3	10	
10	Recorded Video Presentation		CO6	PO10	10	
	TOTAL				100	

Course Instructor:

1. **Dr. Sajid Muhaimin Choudhury**
2. **Barproda Halder (PT)**

Signature of Evaluator: _____

Table of Contents

1 Abstract

This project has simple mechanism to indicate the water level. As it a cost effective indicator it can be used in different places to observe the water level to stop accident or water wastage . When the water level is empty it shows E via seven segment display .If the water level is at 5% the transition goes to L from E .If the water level is at 65% the transition goes to H from L. If the water level is at 90% the transition goes to F from H. If the water level is at 100% there is sound of buzzer.

2 Introduction

The project is basically designed to deal with the water level problem using basic logic ICs. It is small in size with minimized cost . It can be used in factories, households , water storage tanks .Further modification can also be made if possible and can be implied in important purposes such as flood indicator.

2.1 Complexity Analysis

Even if the circuit is simply based on ICs , it can be further modified with automated on-off system. Moreover, only using ICs is not the only solution to the circuit. Transistors or CMOS or with sensors can be used instead of wires that have a high chance of complete oxidization as time goes by. As the water here won't be distilled that means it will be a source of conductance. If BJTs are used then this characteristics of water will be used to switch on/off these as switches. But in our circuit, mainly logic level high and low is used to show the level via seven segment displays.

3 Technical Details of the Design

3.1 Design Method

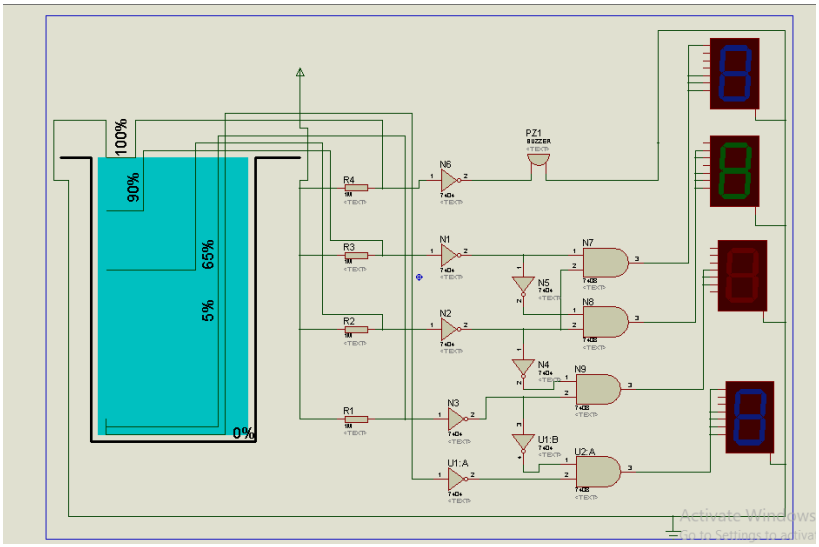


Fig01: Simulation Diagram with basic ICS and 7 segment display

Main components used here are 7404 Ics,7408 Ics, Resistances, Test-tube, Wires, Seven segment displays. When the tank is empty, the input pins of IC 7404 are pulled high via a 1-mega-ohm resistor. So it outputs a low voltage. As water starts filling the tank, a low voltage is available at the input pins of the gate and it outputs a high voltage. When the water in the tank rises to touch the low level, there is a low voltage at input pin 1 of gate N3 and high output at pin 2. Pin 1 of the gate is connected to pin 2 of gate N9, so pin 2 also goes high. Now as both pins 1 and 2 of gate N9 are high, its output pin 2 also goes high. As a result, positive supply is applied to 7 segment display and it shows 'L' indicating low level of water in the tank. Same goes for the other level indicator. When water starts overflowing the tank, pin 1 of gate N6 goes low to make output pin 2. The buzzer sounds to indicate that water is overflowing the tank and we need to switch off the motor pump.

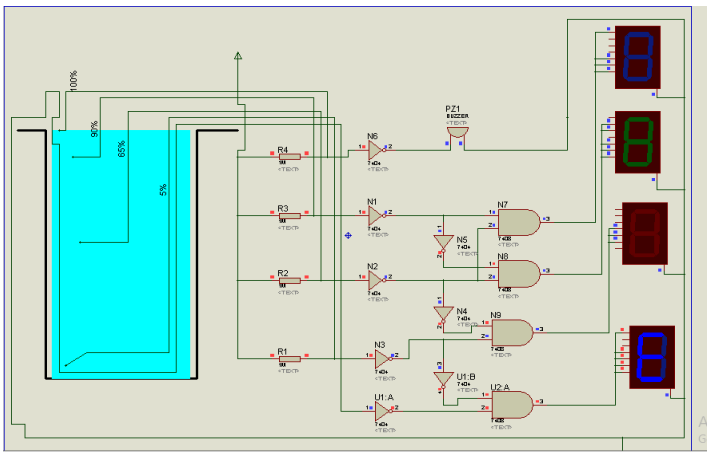


Fig02:Empty State

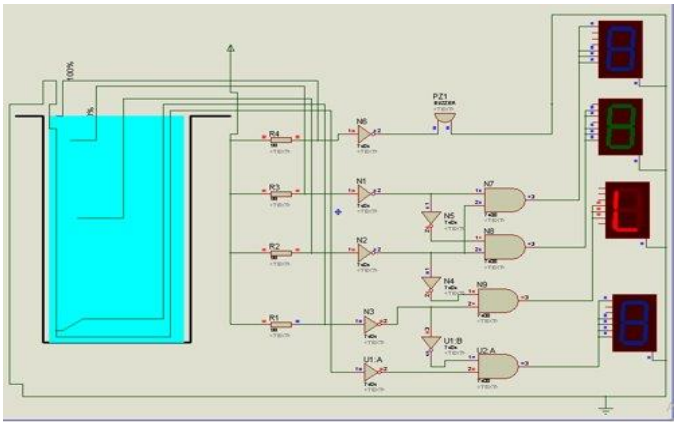


Fig03:Low State

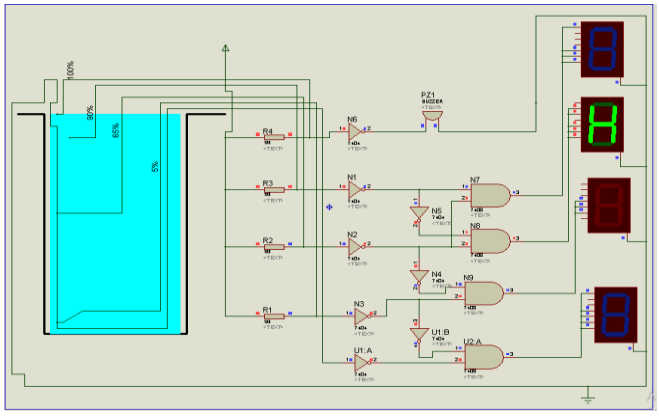


Fig04:High State

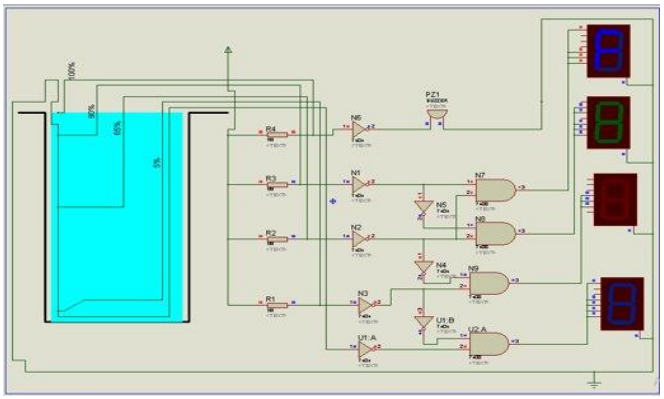


Fig05: Full State

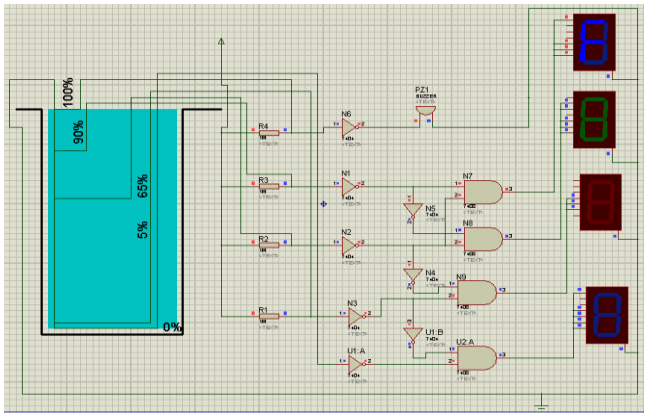


Fig06: Overflow being indicated by buzzer and F in display

3.2 Novelty Statement

This project is simple and most importantly it is all done by logic ICs usually used in lab. It is cost effective as it won't take much space as well as components. But if it is done by microcontroller it will need much more specifications and also the cost will increase lowering the will of people to use it.

3.3Printed Circuit Board Mask Layout

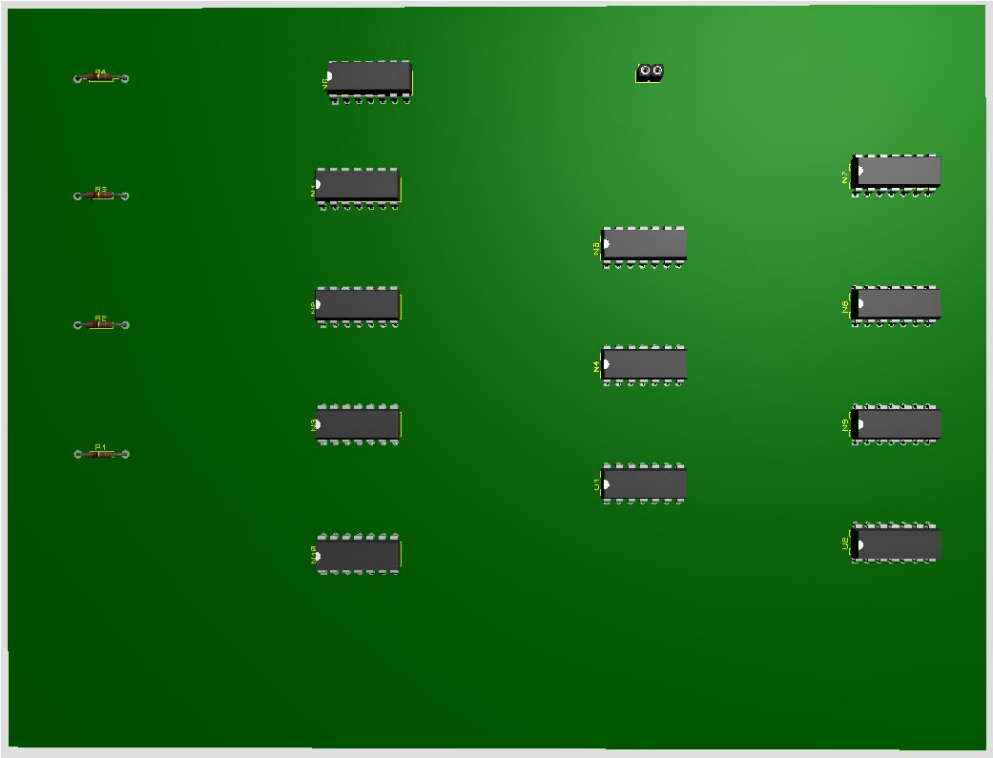
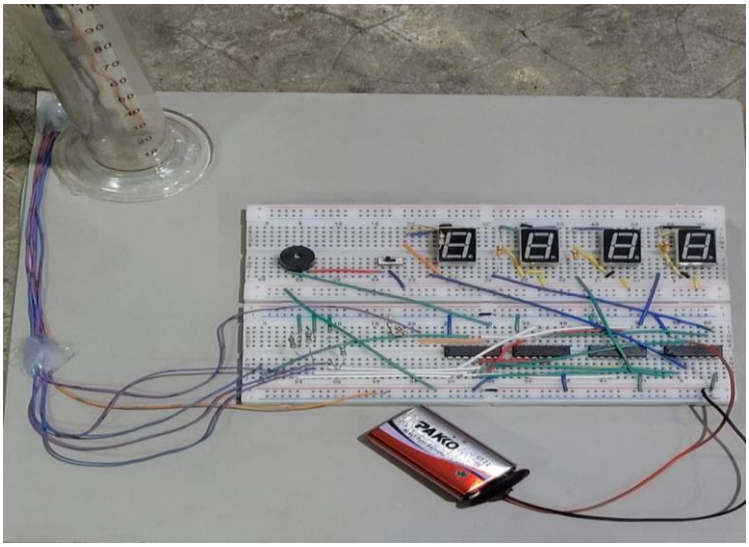
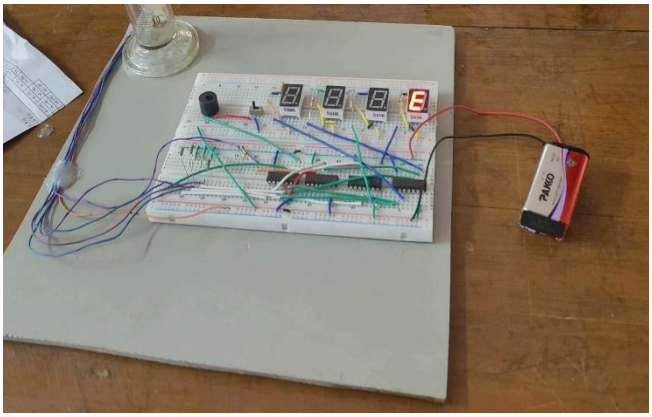
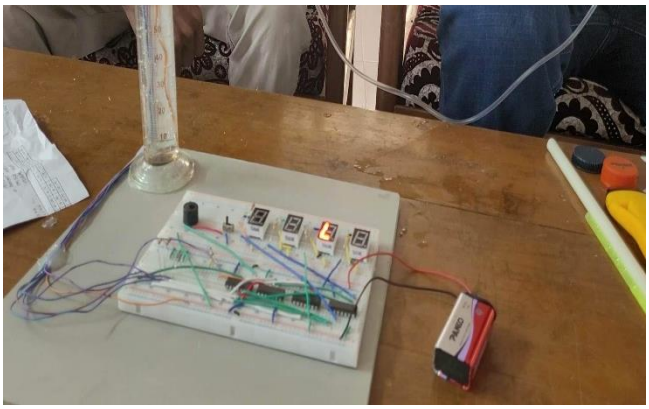


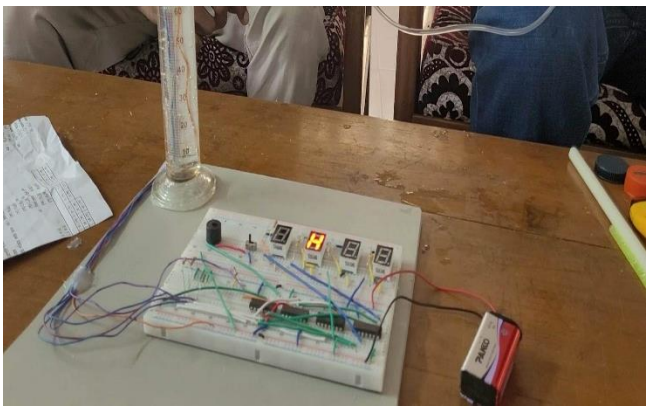
Fig07: PCB LAYOUT

3.4Pictures of Final Implementation









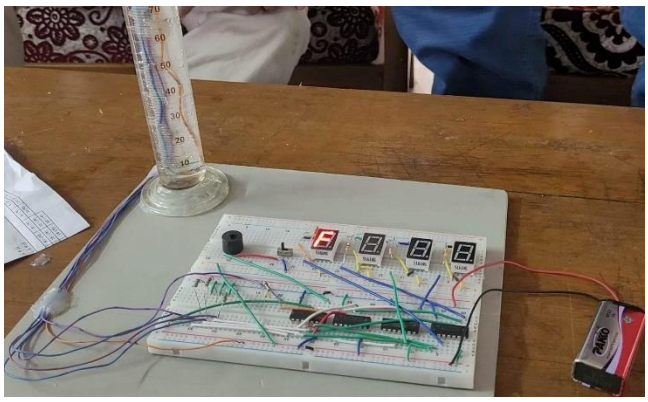


Fig08:Implementation Photos

3.5 YouTube Link

https://youtu.be/TMn8j9goMdU

3.6 Improved Circuit Simulation:

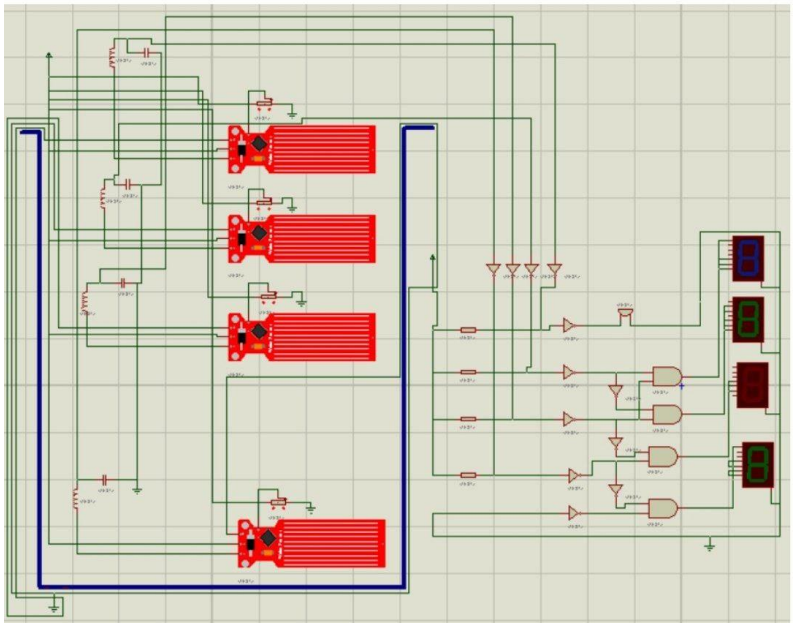
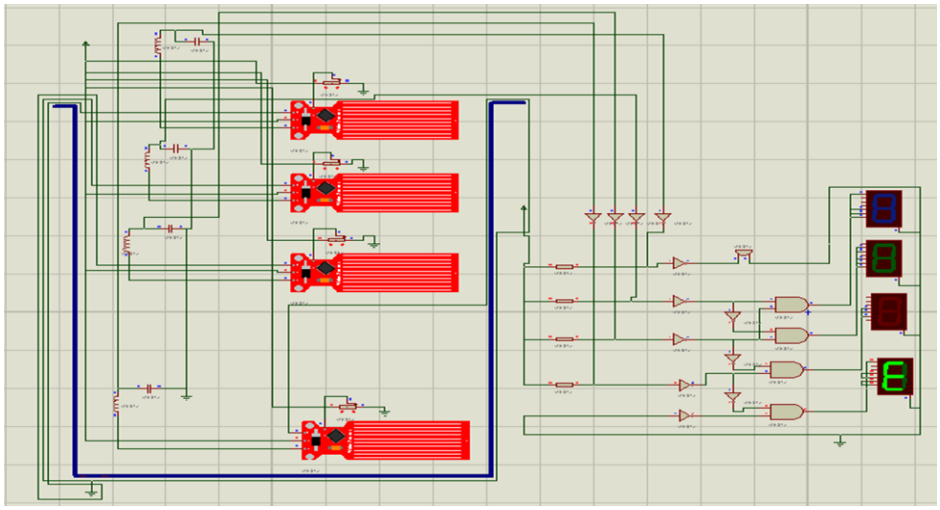


Fig 09:Circuit Diagram Using Water Sensor

This consideration is taken into account for the oxidization problem of the original design of the wires used for water level sensing. The states are given below:



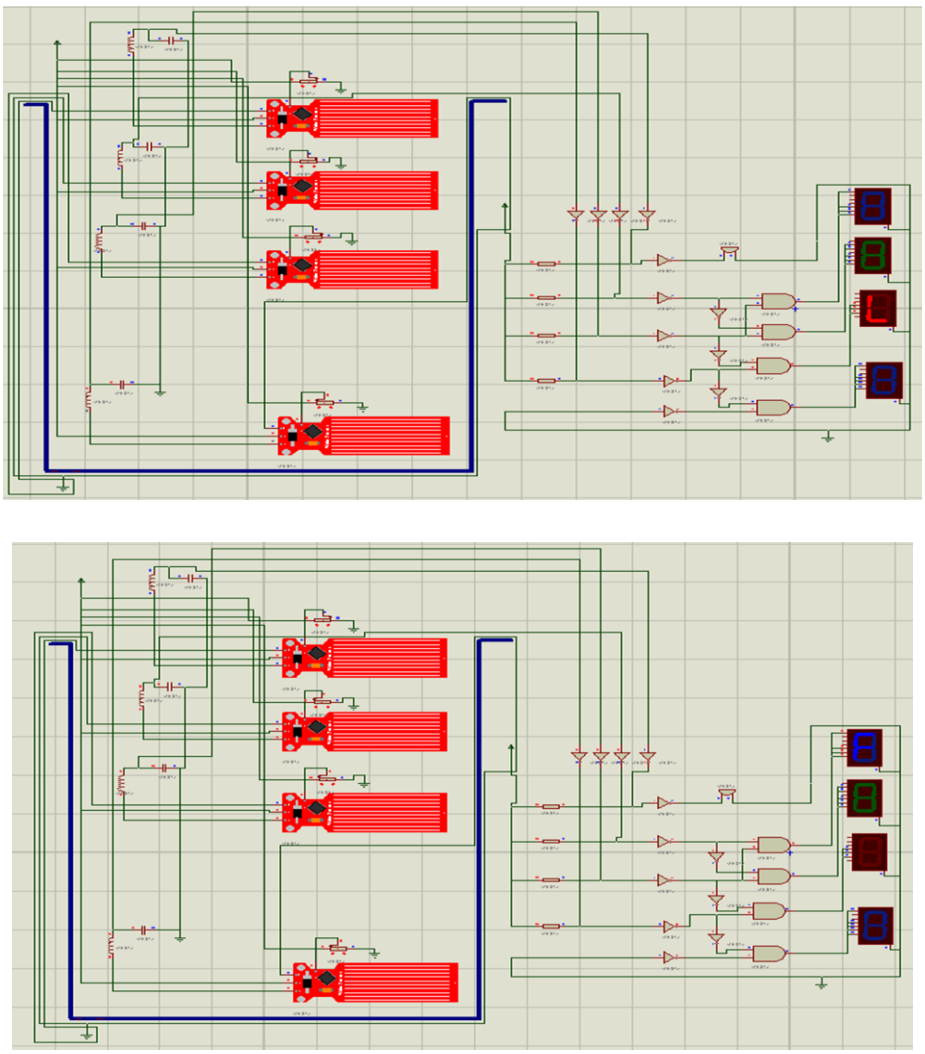


Fig 10: Different states of the improved circuit with water level sensor

4 Practical Design Considerations

4.1 Considerations to Public Health and Safety

Practical considerations are taken into account with the perspective of public health and society. This miniature version can be used in swimming pools and water treatment plants to avoid accidents due to the overflow of water. This actually allows to alert the user of the condition of water level.

4.2Considerations to Environment

The environment perspective is also taken into the account. This can be used to observe the water level in aquariums and agricultural irrigation system to alert the user to monitor the adequate water level as well as alert the authority about the over flow or totally empty state so that the water wastage in these cases can be stopped.

5 Reflection on Individual and Team work

5.1 Individual Contribution of Each Member

For the software implementation two subteams were formed. One of the teams did the basic logic circuit simulation in proteus and tinkercad to ensure the logic actually works. The other team added feature like overflow state as well as worked on the improved design based on water level sensor in proteus. For the hardware implementation, each of the members did their best to contribute a fair share of work. In every work meeting everyone was together. From problem logic build up to problem solving each of the work is done in offline either in library or in the open space of ECE building.

5.2 Mode of Team Work

The mode of the team work is as follows:

Problem Identification → Problem Solving → Modification → Implementation.

For the first stage properly identifying the problem was the main motto. Then the procedure of logic buildup and implementing it into the real life as well as simulation version were done. The last stage was the project output to be shown practically.

6 References

https://www.circuitstoday.com/water-level-controller-using-arduino

https://github.com/iamvishalprasad/Water-Level-Controller-using-8051-Microcontroller