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| **Submission Due on :** | 05th June 2022 | |
| **Type of Coursework:** | Individual/ Group | |
| **Title of the Coursework:** | Water Tank Overflow Alarm and a Water Level Indicator System | |

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**NATIONAL INSTITUTE OF BUSINESS MANAGEMENT**

**DIPLOMA IN SOFTWARE ENGINEERING/DIPLOMA IN NETWORK ENGINEERING**

**COURSEWORK ONE**

**ELECTRONICS AND COMPUTER ARCHITECTURE**

**Title of the Project**

**SUBMITTED BY**

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**Date of Submission: 03/06/2022**

# **DECLARATION**

* We declare that this project report is based on our own work and research carried out in order to fulfill the coursework requirement under the supervision of the lecturer C.D. Muthugamage.

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# SUMMARY

The report contains an in-detailed explanation about an electronic circuit designed to indicate the water levels of large-scale water tanks and an alarm system to prevent the water overflow from the tanks used in the agricultural industry..

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# **CHAPTER 01**

## **Introduction**

This is a circuit system made up using an integrated circuit. It is used to indicate the water levels of a tank using a light system and also a buzzer has been used to get an alarm notification when the water is at a high level and is about to overflow.

## **Features of the Product**

1.

* What is the feature:
  + Switch for the LED light system
* Purpose of the feature:
  + Turning off and on the light system manually when needed.
* How it affects the system:
  + We can turn on the light system before switching on the water pump. In that way we can get to know the level of the water getting filled at that moment.
  + Similarly, we can turn it off when we don’t want to get the water level indication.

2.

* What is the feature:
  + LED light system
* Purpose of the feature:
  + Indication of the water levels of the tank using 3 LEDs selected from 3 standard universal colours red, yellow, and green respectively for high, mid, and low levels.
  + RED – HIGH LEVEL  
    YELLOW – MID LEVEL  
    GREEN – LOW LEVEL
* How it affects the system:
  + When the water gets filled up to the relevant level the respective LED will glow.
  + And when the water is getting lowered from that relevant level the connected LED will stop its emission.

3.

* What is the feature:
  + The buzzer
* Purpose of the feature:
  + Indication of an alarm when the water from the tank is about to overflow.
* How it affects the system:
  + This buzzer starts working when the pump is switched on and the water level is reached up to the high level at the same time. By turning the pump off we can prevent the water from overflowing.
  + This feature is helpful for the people with vision disabilities.

4.

* What is the feature:
  + Portable rod
* Purpose of the feature:
  + Get the exact water level from the tank
* How it affects the system:
  + This rod is portable and no need to plant inside the water tank. So, we can use it in other tanks as well.
  + Since this is made up using wood it can be used in any liquid tanks to get the level indication.

# **CHAPTER 02**

## **2.1 Circuit Components**

|  |  |
| --- | --- |
| **Component** | **Amount** |
| 1. Breadboard | 1 |
| 1. Integrated Circuit 7408 | 2 |
| 1. Battery 1.5V | 4 |
| 1. Resistor 600Ω | 8 |
| 1. Resistor 10kΩ | 6 |
| 1. LED | 3 |
| 1. Buzzer | 1 |
| 1. Switch | 2 |
| 1. Circuit Wires(1m) | 2 |
| 1. Jumper Cables | 6 |

## **2.2 Truth Tables**

INPUTS

S - Switch for the light system(All 3 water levels will be a single input)

W - Water level

P - Switch for the pump

OUTPUTS

L - LED system(All 3 LED will be a single output)

A - The alarm

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S | W | P | L | A |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 |

## **2.3 K Maps**

**L**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P  SWWW | 00 | 01 | 11 | 10 |
| 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 1 | 0 |

SOP = SW

POS = SW

**A**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P  SWWW | 00 | 01 | 11 | 10 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 |

SOP = WP

POS = WP

## **2.4 Circuit Diagrams**

-5V



+5V



1



10KOHM RESISTOR

GREEN LED



H



M

2



600OHM RESISTOR

YELLOW LED



L

3



COMMON

RED LED



4

BUZZER



LIGHT SYSTEM SWITCH



PUMP SWITCH

Pin 7 – GND , Pin 14 – Vcc

AND GATE 1 Pin 1 – Low level input

Pin 2 – Common line

Pin 3 – Green LED

AND GATE 2 Pin 4 – Mid level input

Pin 5 – Common line

Pin 6 – Yellow LED

AND GATE 3 Pin 10 – High level input

Pin 9 – Common line

Pin 8 – Red LED

AND GATE 4 Pin 13 – Output of 8th pin(High level)

Pin 12 – Pump switch

Pin 11 – Buzzer

# **CHAPTER 03**

## **3.1 Results of the operation**

* Condition 01:
  + Pump switch on
  + Light switch on
  + Rod is fully immersed
* When water level increases and touches the 1st sensor wire, the green LED will glow indicating that there is low amount of water in the tank
* When tank is half full , then the 2nd LED in yellow will glow
* When the water in the tank rises to full, the Red LED will glow with the indication of the alarm
* When the tank gets emptied, alarm and the LEDs will stop their indications respectively
* Condition 02:
  + Pump switch on
  + Light switch off
  + Rod is fully immersed
* Only the alarm of the buzzer will work meaningly buzzer is only

dependent on the high-water level and the pump switch

* None of the LED lights will glow
* Condition 03:
  + Pump switch off
  + Light switch on
  + Rod is fully immersed
* Only the LED set will glow. LEDs work according to the water level inputs and its switch input
* Buzzer will not work

# **CHAPTER 04**

## **4.1 Limitations, Recommendations and Conclusion**

Limitations

* The pump does not automatically shut off when the tank is full.
* Once the tank is empty, the pump does not automatically switch on.
* If one of the LED lights get burnt there is no specific method to find it out. We have to wait until the water get filled into the tank.
* Durability of the circuit is low due to the rust and deterioration issues.
* Permanent installation of the water level indicator inside the tank will be a complex process.

Recommendations

* When the water tank is full or empty, we can upgrade the pump switch to work automatically (automatic turn off and on).
* We can insert an indicator to the circuit to check if the LEDs are burnt.
* Rather than only using the water pump to fill the tank we can advance the circuit to get automatically filled with the rainwater when it is raining. In that way we can use an automated tank lid to open and close automatically when it is raining.
* We can also add a soil moisture detection circuit. Once the soil of the crops is dry the water inside the tank will automatically flows to the crops and will stop automatically after the process is done.
* We can create a small software to implement the whole circuit using an electronic device.

Conclusions

* Can implement the circuit in any water resources such as rivers streams canals or tanks. The light system will help to indicate the water level.
* This can be used as a flood indicator. The alarm system will be useful to perform immediate actions in case of a severe flood instance.
* In a case of a breakdown of one the switches we can still get the indication of the water levels from the remaining one as the two switches are independent.
* This system is ideal for water tanks as well as for other related liquid storages.
* Could be used in both industrial and domestic purposes.
* This is a low investment project with more cost benefits.

## **REFERENCES**

* <https://www.etechnog.com/2019/02/ic-7408-pin-diagram-data-sheet-application.html>
* Digital electronics-lab.manual(1985) by James Bignell and Robort Donovan
* Digital computer electronics(1977) by Albert Paul Malvino

# **APPENDIX**

* Appendix A:

<https://www.electronics-tutorials.ws/logic/logic_2.html>

* Appendix B:

<https://scholar.google.com/>