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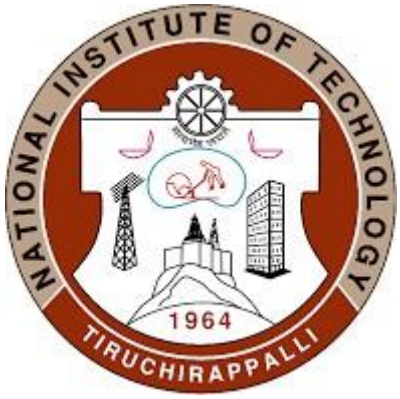

ECLR 10

DEVICES AND NETWORKS LABORATORY

MINI PROJECT

Faculty: Dr. R. K. Kavitha.

Mini Project Title:

Automatic Water Level Indicator and Controller

Section- ECE-A.

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OBJECTIVE:

To make an automatic water level indicator and controller to prevent overflow of water from the overhead tanks.

ABSTRACT:

Water is very precious for the living beings and scarcity of the same is gradually increasing. Most of the cities in the county and that of the world are facing this problem. We all use water daily for various purposes but not many of us really care for the unnecessary wastage of water. In many houses there exists unnecessary wastage of water due to overflow from overhead tanks etc.

It can be said that, about 95% of the Earth's water is in the oceans which is unfit for human consumption. So, out of the remaining 5%, about 4% is locked in the polar ice caps and the rest 1% constitutes all fresh water found in rivers, streams and lakes which is suitable for our consumption. A study estimated that a person in India consumes on an average of 140 litres per day which would rise by 40% by the year 2025.

Hence, it is of utmost importance to preserve and save water. Automatic Water Level Controller can provide a solution to problem of unnecessary wastage of water due to overflow from the overhead tanks.

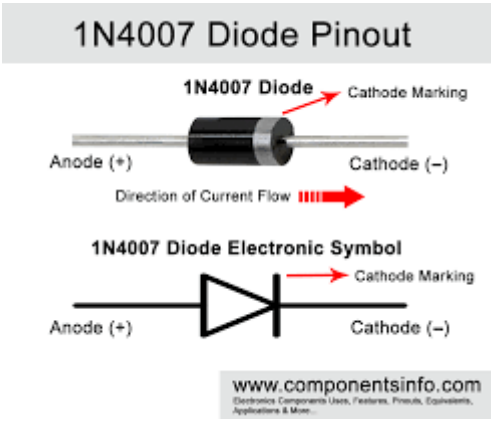
To reduce the wastage of water, in this mini project, we have constructed an automatic water controller which will automatically turn ON and OFF by detecting the water level in the tank.

COMPONENTS:

Components	Type/Range	Quantity
Transistor	BC547	5
Resistor	220 Ohm	4
	1 K Ohm	2
	180 K Ohm	1
	22 K Ohm	2
	1 M Ohm	2

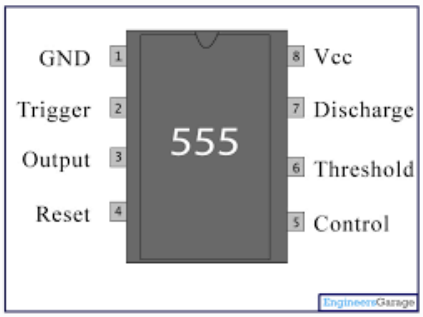
LED		5
Capacitor	100 nF	1
Relay	9-12 V	1
IC 555		1
Battery	5 V 12 V	1 1
Water pump	5V	1
Diode	1N4007	1

1. **1N4007 Diode** - The diode is responsible for providing transient voltage suppression. The idea behind having a diode is to ensure a smooth transition between states when the relay is switched such that any transient voltage spike is suppressed.

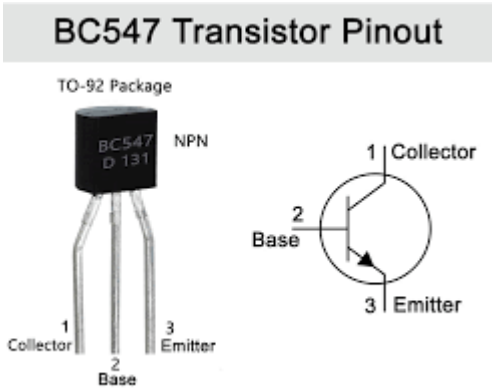


2. **Resistors**: resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines.

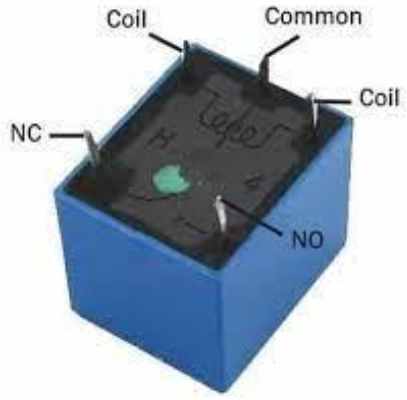
3. **555 Timer**: A 555 timer can be used to create a Schmitt trigger inverter gate which converts a noisy input into a clean digital output. It gets HIGH when the trigger input is less than 1/3vcc.we can reset back by applying a LOW voltage at 4^{th} pin. IC555 package includes 25 transistors, 2 diodes and 15 resistor on a silicon chip installed in an 8- pin dual in line package.



4. **BC547 Transistors** - BC547 is general silicon, NPN, bipolar junction. It is used for amplification and switching purposes. The current gain may vary between 110 and 800. In this project these transistors are acting as switches. It will act as closed switch when voltage at base terminal is greater than or equal to 0.7V, else it will act as open switch. It will display the common emitter configuration and is made up of silicon.



5. **Relay**: A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. It has 3 states Normally open (NO), Normally closed (NC) and Common.



Relay Terminals

CIRCUIT DIAGRAMS:

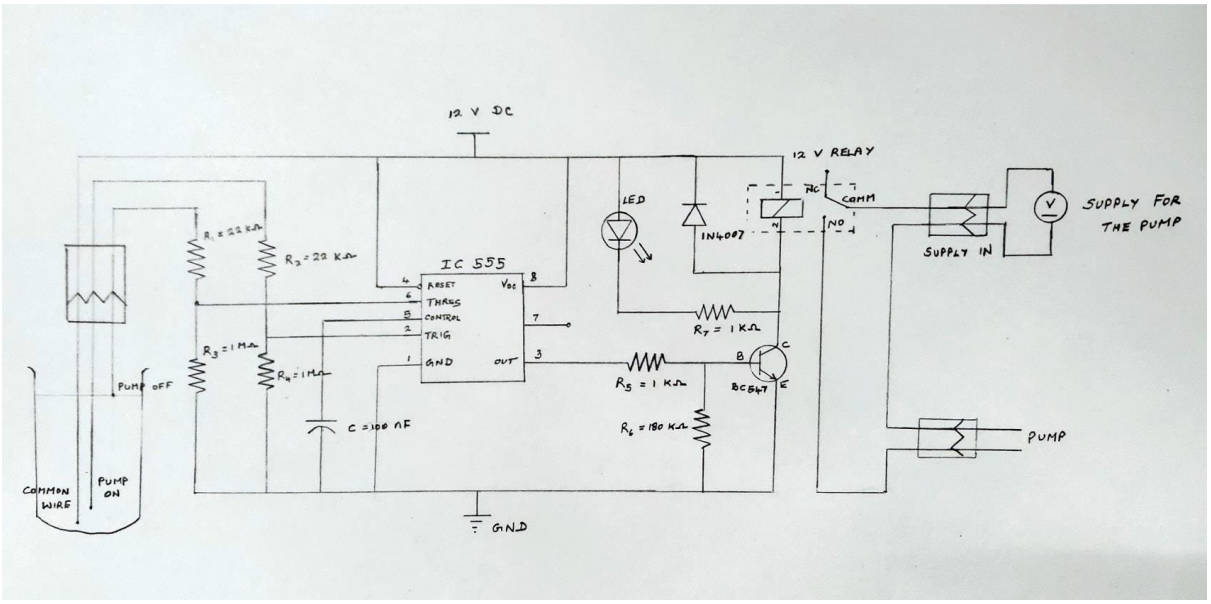


Fig 1: Automatic water level controller circuit

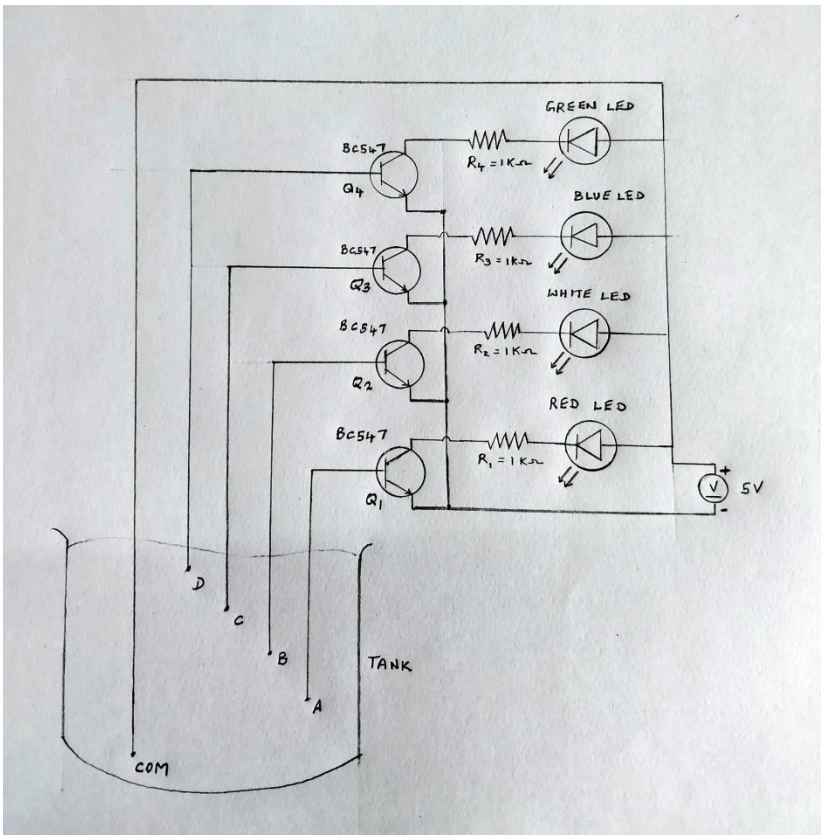


Fig 2: Water level detector

DESCRIPTION:

In the above circuit (fig 1), three wires are dipped into the water to turn on and off the water pump automatically. The common wire is connected to the 12v dc supply, the ‘pump on’ wire is connected to the trigger pin of IC555, and the ‘pump off’ wire is connected to the threshold pin of IC555. In IC555, the output goes HIGH when the voltage at the second pin (trigger pin) is less than 1/3 Vcc. Also, we can reset back the IC by applying a LOW voltage at the 4th pin (Reset pin). The probe from the bottom level is connected to the trigger (2nd) pin of 555 IC. So, the voltage at the 2nd pin (Trigger) is 12v (Vcc) when it is covered by water. When the water level goes down, the 2nd pin gets disconnected(untouched) from water, i.e., the voltage at the trigger pin becomes less than Vcc. Then the output of 555 becomes high. The output pin is connected to the transistor’s base terminal, which was initially low. Since high voltage appears across the base terminal of the transistor, it becomes active and starts conducting. In this circuit BC547 npn transistor is used as a switch. It is connected in common emitter configuration.

A relay is connected between the transistor's collector terminal and the pump's power supply. Initially, when no supply is given to the relay, the COMMON is connected to the NC (Normally Closed). The relay's NO (Normally Open) connection is not connected until the relay turns on. When the transistor is active, the relay gets the supply and the common connection shifts to the Normally Open (NO) terminal. This establishes the connection between the power supply and the pump, and the tank gets filled with water. The diode is responsible for providing transient voltage suppression. The idea behind having a diode is to ensure a smooth transition between states when the relay is switched such that any transient voltage spike is suppressed. In short, the diode takes the energy stored in the relay's coil when you switch the current off. Without the diode, the energy has no place to go and will cause a large and probably destructive voltage spike.

The pump will be on till it reaches the 'pump off' wire. When the water touches the pump 'off' wire, a connection establishes between the 'pump off' wire and the common wire. Since the 'pump off' wire is connected to the threshold input of IC555, the voltage at the 6th pin is 12v (Vcc). In IC 555 the output goes low when the threshold input is high. When the output is low, the transistor becomes inactive and there will be no supply to the relay. In such case, the common shifts to NC terminal of the relay and the pump

automatically turns off. The LED in the circuit is used to indicate the state of the water pump (on or off).

In the water level detector circuit (fig 2), the BC547 is used as a Switch. We have attached resistors of 220 Ohm at the base of transistors Q1, Q2, Q3, Q4 to avoid the transistor from being destroyed from high current across the LEDs. When no voltage is applied at the base of transistors, there is no current flowing through the collector and emitter terminal of the Transistor. In result, LED will remain OFF.

When the water level reaches the point A, a conductive path is created between the base of transistor Q1 and the positive terminal of the battery. Therefore, the positive side of battery and base of the transistor Q1 gets connected with each other. As soon as the positive voltage is applied at the base of transistor Q1, the transistor Q1 is turned on and the RED LED starts glowing.

Like the above process, a conductive path is formed between the base of transistor Q2 and the positive terminal of the battery, as soon as the water level reaches point B. A positive voltage is applied at the transistor which turns ON the white LED.

As the water level reaches to point C, the Transistor Q3 is turned ON due to the conductive path created and a positive voltage is applied at the base of it. This turns ON the blue LED connected to the transistor Q3.

Similar to the above process, a conductive path is formed between the base of transistor Q4 and the positive terminal of the battery, as soon as the water level reaches point D. A positive voltage is applied at the transistor which turns ON the red LED. This indicates that the container is full.

OUTCOMES:

1.Water Maximization: On an average according to the statistics 40 L of water is being wasted per overflow. This device can prevent the overflow of water in a tank while pumping and provide with the maximum use of your water at the appropriate times.

2.Drought period: Water level monitoring can have a wide variety of environmental benefits, such as improved visibility on potential drought situations and use the water with care.

3.This device can be used in places to control water level.

FUTURE SCOPE:

Main intension of this project is to establish a flexible, economical, and easy configurable system which can solve water losing problems. In the near future as home automation web-based water level monitoring and controlling system can be designed, through which the system can be controlled from any place via internet through mobile phone (IoT). It can be modified and put to great use like taking preventive steps when some natural calamities like floods, drainage overflows etc. are detected and for avoiding highly in-toxic liquid overflows in chemical plants etc. This could save precious lives of number of living beings. Also the assets purchased from hard earned money could be refrained from getting damaged with the prior information from such automated indicators and controllers.

REFERENCES:

1. www.researchgate.net
2. http://nebula.wsimg.com/2287f950faf58c1698f809555218d339?AccessKeyId=DFB1BA3CED7E7997D5B1&disposition=0&alloworigin=1