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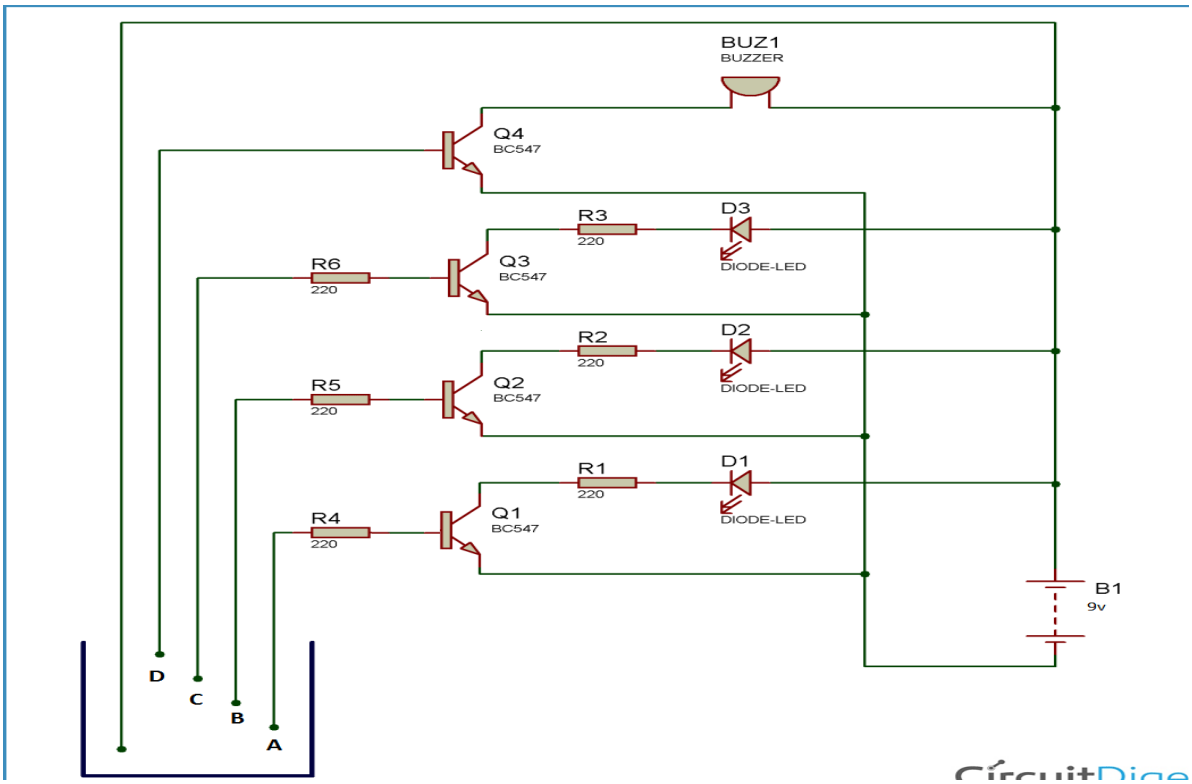
TITLE OF THE EXPERIMENT:-

Title:-Transistor based Water Level Indicator Alarm/ Buzzer

Abstract:-

Water tank overflow is a common problem which leads to the wastage of water. Though there are many solutions to it like ball valves which automatically stop the water flow once the tank gets full. It is a simple circuit which will detect the water level and will raise an alarm upon getting the water tank full or a preset level. This **simple transistor based water level indicator circuit** is very useful to indicate the water levels in a tank. Whenever tank gets filled, we get alerts on particular levels. Here we have created 4 levels (low, medium, high and full), we can create alarms for more levels. We have added 3 LEDs to indicate initial three levels (A, B, C), and one Buzzer to indicate FULL level (D). When tanks gets filled completely we get beep sound from Buzzer.

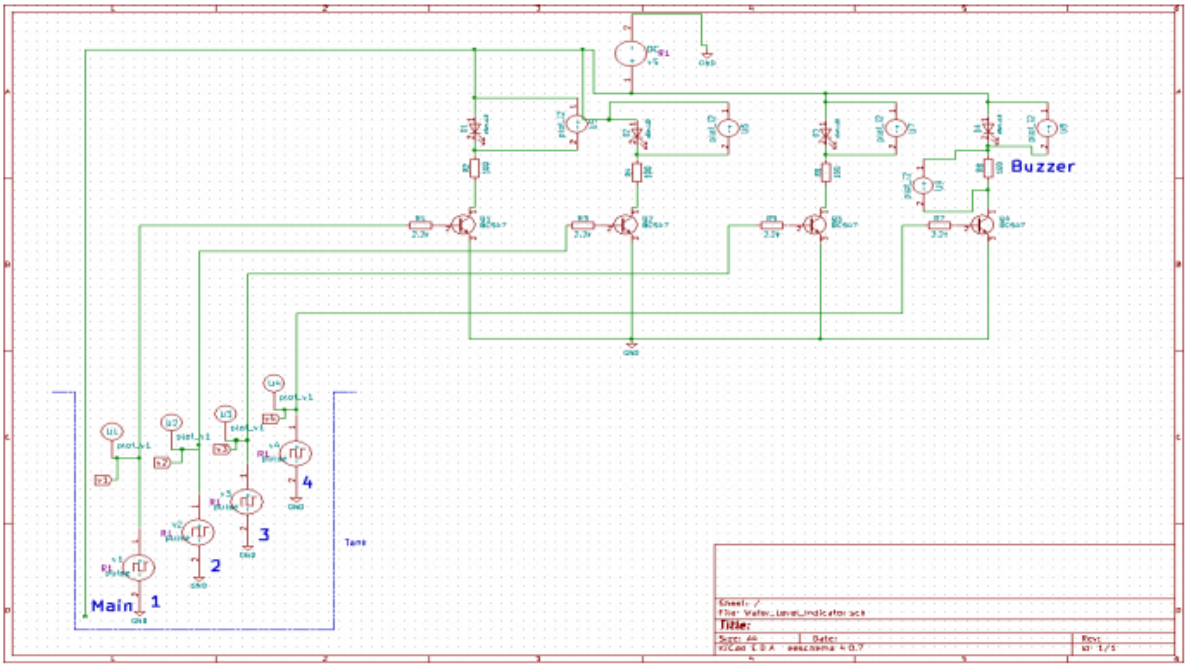
Circuit Diagram:



eSim Required Components:-

Water Level Indicator	
Component Name	**Type**
BC547	Transistor
eSim_Led	Led
pulse	pulse voltage source
DC	DC voltage source

eSim Circuit Design Screenshot:-



Circuit Description:-

We can consider this whole circuit as 4 small circuits, each one for indicating/alarming, when a particular level of water have been reached. When water level reaches to a particular level (Level 1, 2, 3) then the Led corresponding to that level (Green, Yellow, Orange) will start glowing. And finally when tank gets full (Level 4), circuit with buzzer and corresponding Led gets completed and buzzer starts beeping and Led (Red) starts glowing.

Working

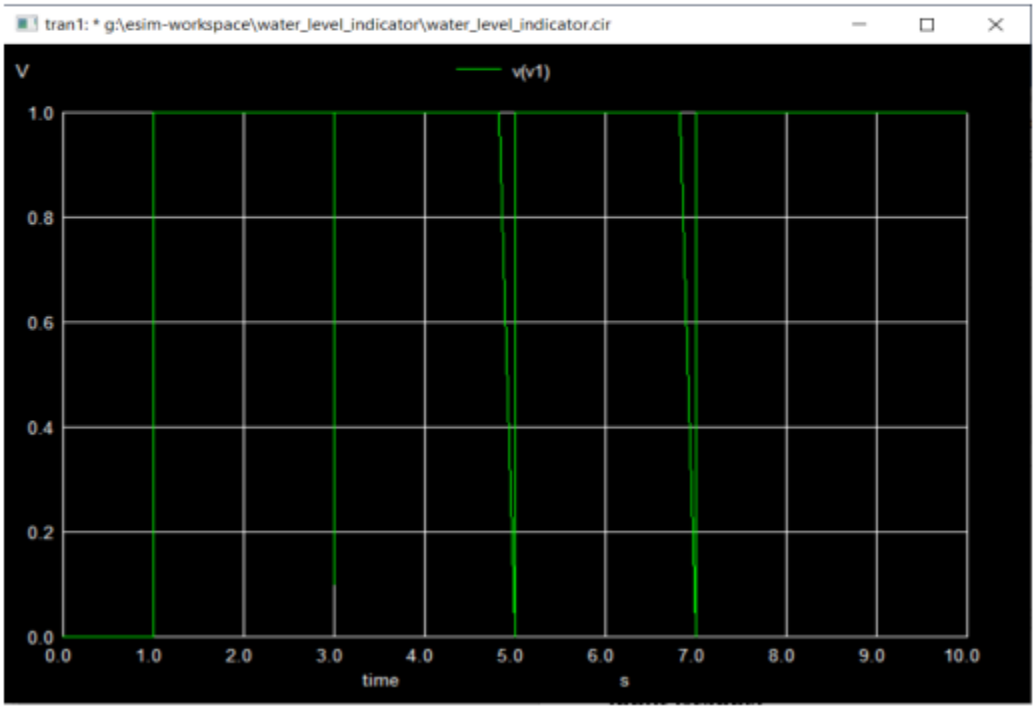
Here we are using transistor (of NPN type) as a Switch. Initially there is no voltage applied to the base of the Transistor Q1 and the transistor is in OFF state and no current is flowing through collector and emitter and LED is OFF (See below diagram to understand Transistor Pin structure).

When the water level reaches to Point A in the tank, the positive side of the battery gets connected to the base of the Transistor Q1 through the water. So when a positive voltage has been applied to the base of the Transistor Q1, it gets into ON state and current starts flowing from collector to emitter. And RED LED glows. You can see resistors (R1, R2, R3) at the base of each transistor, which is used to limit the maximum Base current. Generally a transistor gets its ON state fully when a voltage of 0.7 V is applied to the base. There are also resistors (R4, R5, R6) with each of the LEDs, to drop the voltage across LEDs, otherwise LED may blow up. Same phenomenon happens when water level reaches to Point B. As soon as water level reaches to Point B, a positive voltage gets applied to the Transistor Q2, it gets ON and current started flowing through YELLOW LED, and LED glows. With same principle, GREEN LED glow when water level reaches to Point C. And finally Buzzer beeps when water level reaches to D.

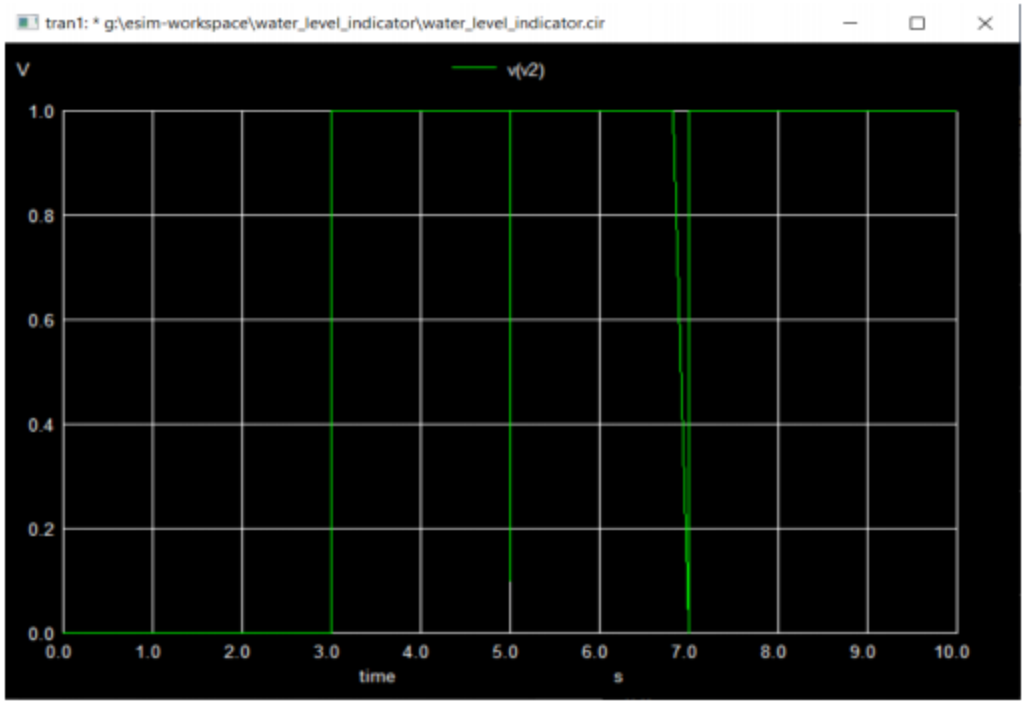
Ngspice Graphs Screenshots:-

Input Graphs:-

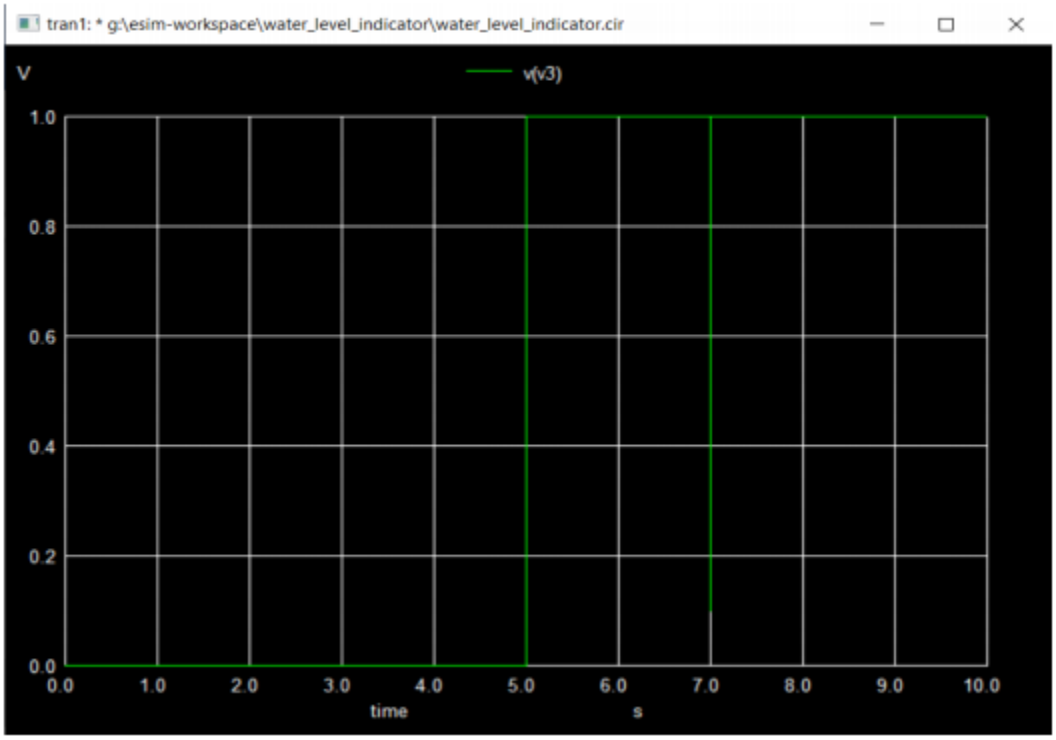
1.For v1:-



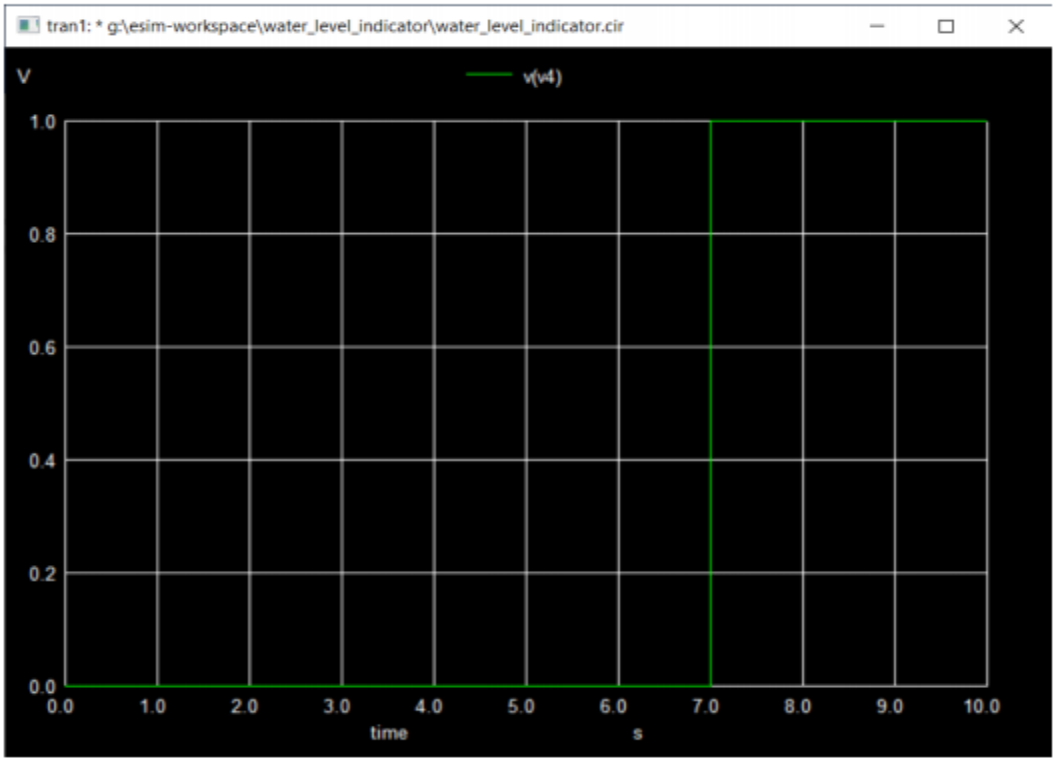
2.For v2:-



3.For v3:-

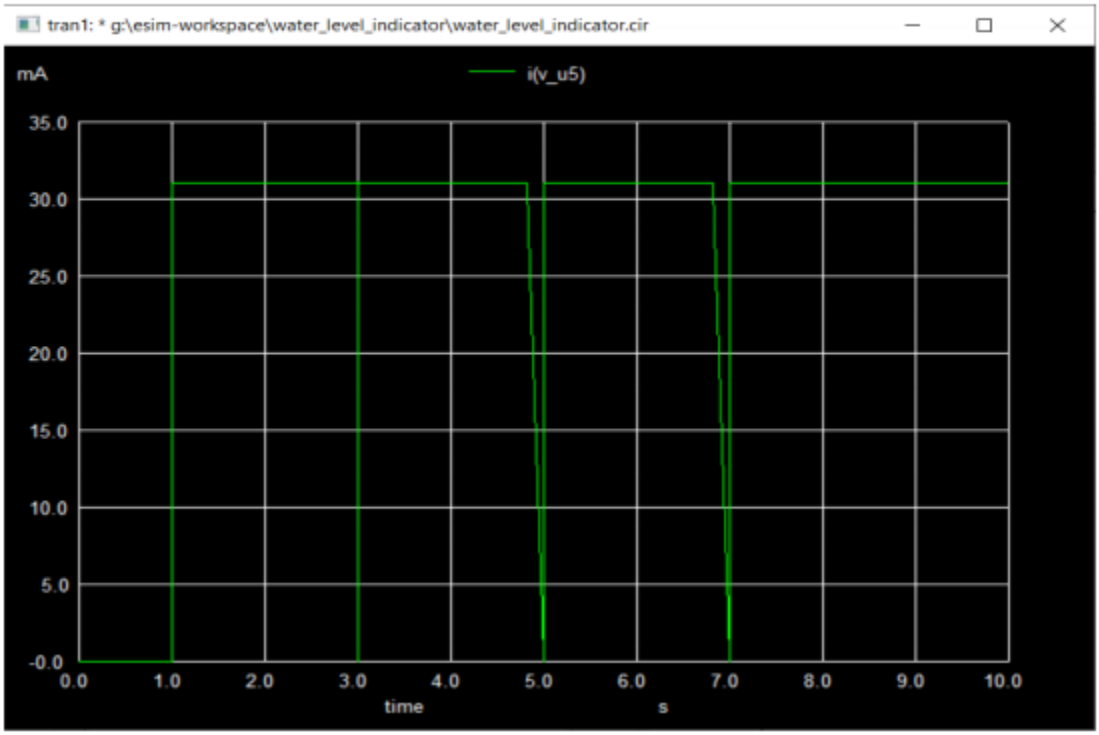


4.For v4:-

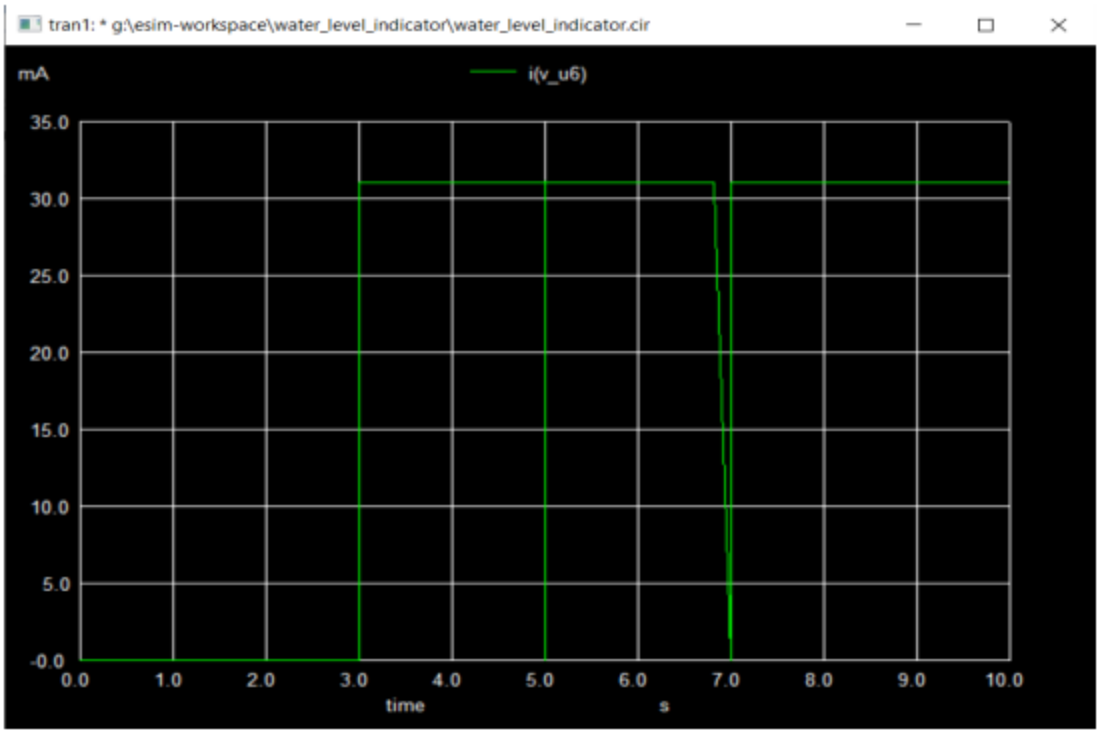


Output Graphs Screenshots:-

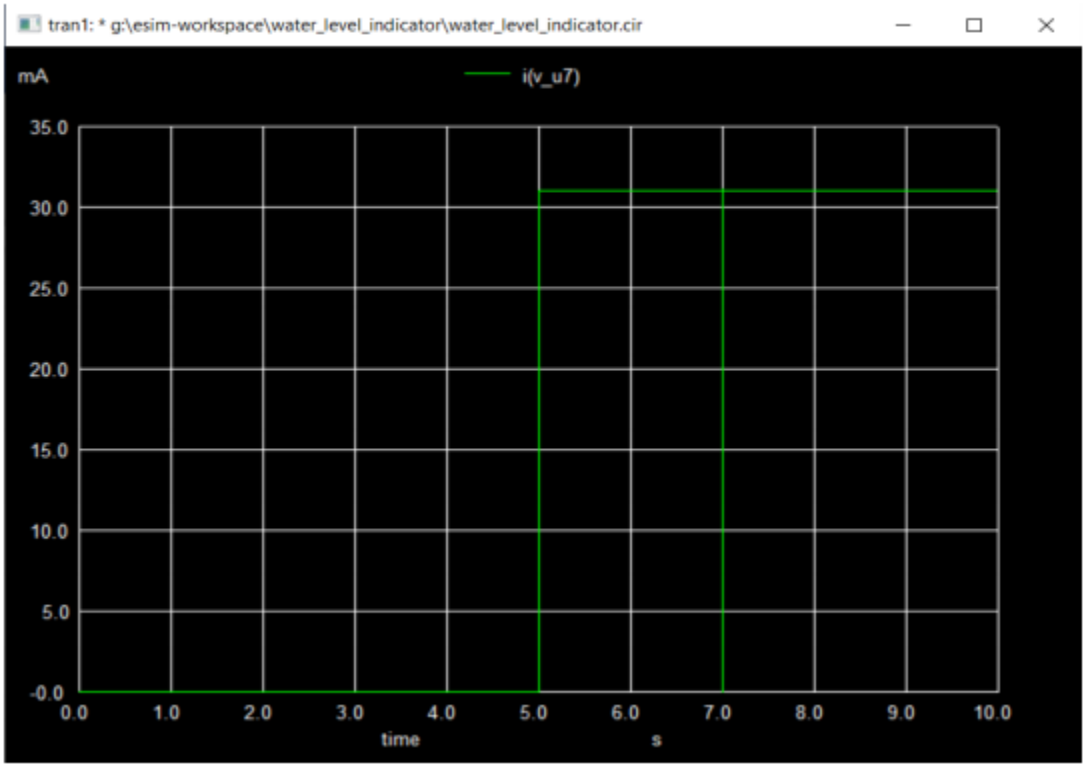
For Led D1 (Green):-



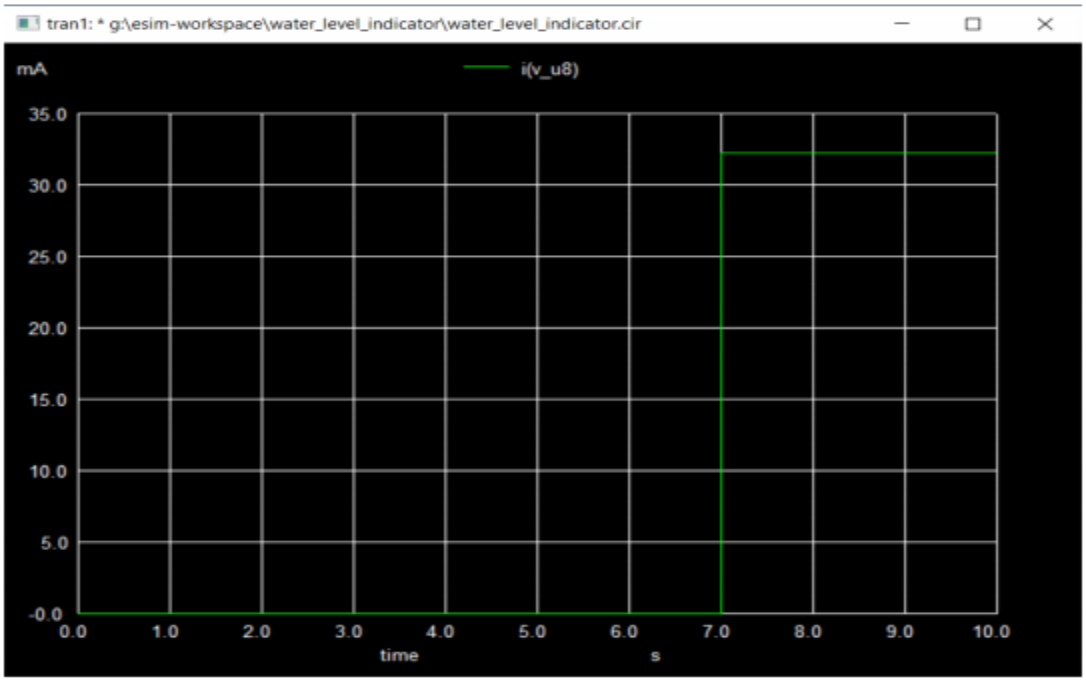
For Led D2 (Yellow):-



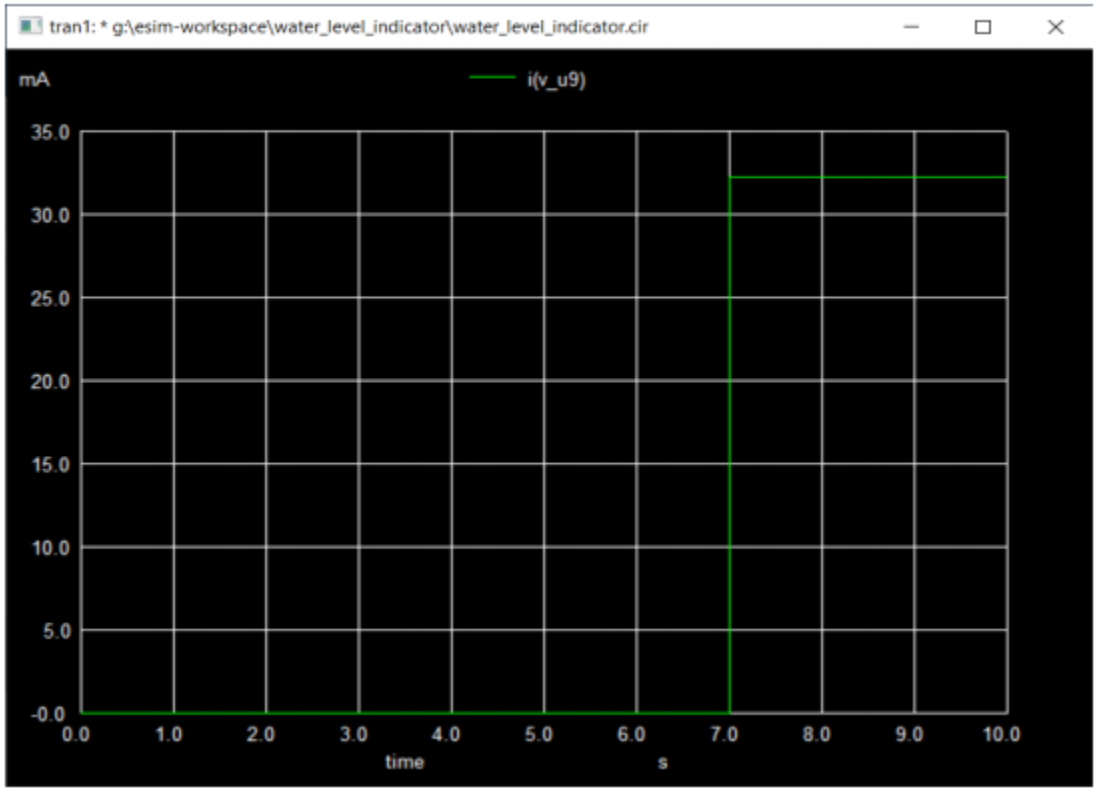
For Led D3 (Orange):-



For Led D4 (Red):-

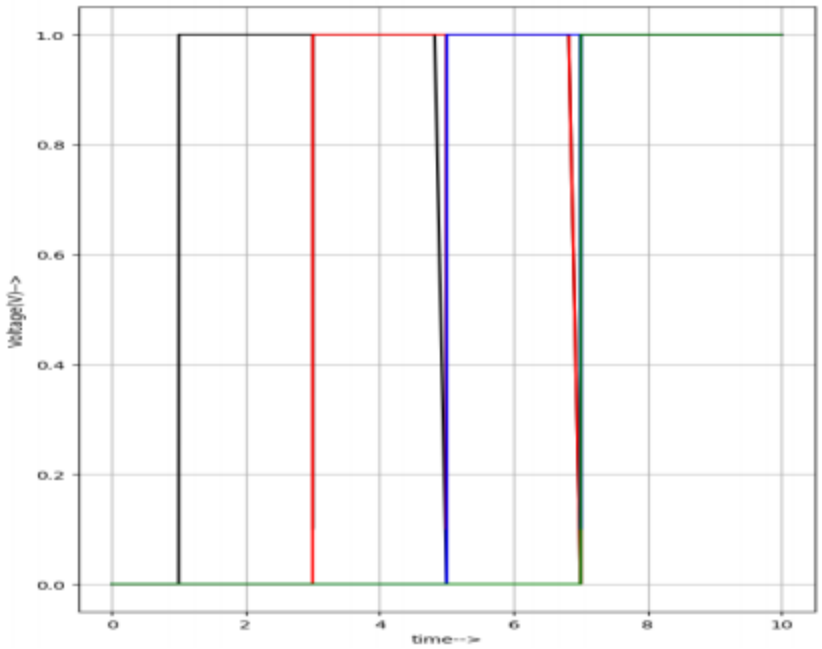


For R8 (Buzzer):-



Python Plot Graph:-

1.Combined Input Voltage Graph:-



Here

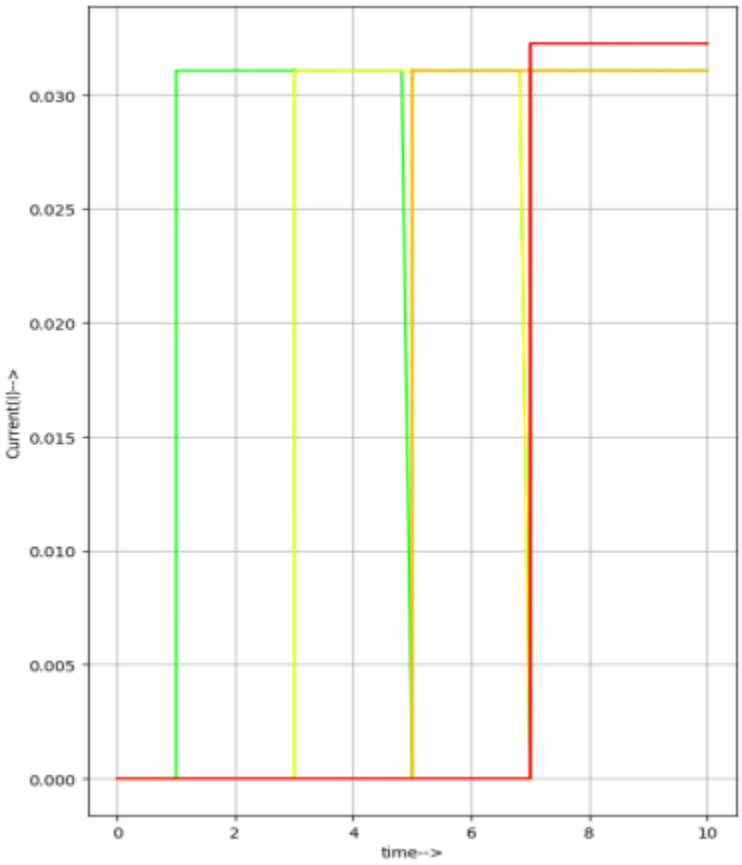
v1-Black line

v2-Red line

v3-Blue line

v4-Green line

2.Combined Output Current Graph:-



Here

Led D1 (Green)-Green line

Led D2 (Yellow)-Yellow line

Led D3 (Orange)-Orange line

Led D4 (Red)-Red line

R8 (Buzzer)-Red line

Observations:-

The Ngspice and Python Plot graphs displays that as the water reaches at each level after a fixed interval of 2 seconds each the current begins to flow through the LED belonging to that particular level, and therefore it starts glowing. Finally after 7 seconds when water reach to the top level the branch having buzzer and Red led becomes conducting and as a result the Led starts glowing and buzzer starts beeping.

Observations at definite intervals:-

1. At t = 0 seconds:-

Water level starts rising in the tank.

2. At t = 1 seconds:-

Water level reaches the 1st mark. So LED1 (Green) starts glowing.

3. At t = 2 seconds:-

Water level continues to rise.

4. At t = 3 seconds:-

Water level reaches the 2nd mark. So LED D2 (Yellow) starts glowing.

5. At t = 4 seconds:-

Water level continues to rise.

6. At t = 5 seconds:-

Water level reaches the 3rd mark. So LED D3 (Orange) starts glowing.

7. At t = 6 seconds:-

Water level continues to rise.

8. At t = 7 seconds:-

Water level reaches up to the brim. So Led D4 (Red) starts glowing and buzzer starts beeping.

The Led (Red) glows and buzzer beeps continuously until the water level reduces or the power supply is switched off.

References:-

- https://circuitdigest.com/electronic-circuits/water-level-indicator-alarm-circuit