

11. Design an IoT based system which measures the physical and chemical properties of the water and displays the measured values.

-Aims To display the physical and chemical properties of water.

Components Required-

1. Arduino UNO
2. Male/female Jumper wires
3. HC-05 Bluetooth Module
4. RGB Diffused Common cathode
5. Resistor 330 ohm
6. Rotary potentiometer
7. Alphanumeric LCD, 16 x 2
8. Resistor 1k ohm.
9. Wire stripper & cutter, 26-14 AWG solid & stranded wires

TDS :-

TDS stands for Total dissolved Solids. As the name suggest, It gives us the number of solids dissolved in a certain amount of water in ppm, (parts per million).

TDS is calculated based on electrical conductivity (S/m)

The higher the electrical conductivity, the higher the TDS value - Here is a list of TDS values of different types of water.

- * Pure water: 80-100
- * Tap water: 250-350
- * Ground water: 500-1000
- * Sea water: around 30000

As by WHO, the suitable TDS of drinking water is below 300. However the tap water of TDS below 100 can't be consumed, as it would lack the essential Minerals. Water above 500 is considered to be too hard as it contains more minerals than healthy.

Normally Normally, we use TDS Pen to measure the TDS of water. However, we can't integrate the pen with Arduino So, there are special TDS meters available that can be integrated with Arduino.

Circuit:-

* Arduino:-

- * Connect 5V of Arduino to one power rail of the breadboard
- * Connect the ground of Arduino to the other power rail of the breadboard.
- * Connect one end of a 1k-ohm resistor to the ground and the other end to breadboard
- * Connect ~~Analogy~~ Pin A0 on the Arduino to the resistor
- * finally, Connect a wire to the resistor and other wire to V
- * Connect the free ends of these wires to Crocodile clips

LCD Displays

- * Connect VSS Pin to the ground rail.
- * Connect VDD Pin to 5V rail.
- * Connect VO to the centre pin of Potentiometer.
- * Connect ends of Potentiometer to 5V and ground
- * Connect RS pin to Arduino pin 7
- * Connect R/W Pin to the ground rail
- * Connect E pin to Arduino pin 8
- * Connect D₄ to Arduino pin 10
- * Connect D₅ to Arduino pin 11, D₆ to Arduino pin 12 & D₇ to Arduino pin 13

Hc-05 Bluetooth module

- * Connect VCC pin to 5V rail
- * Connect GND pin to the ground
- * Connect Tx Pin to Arduino pin 3 & Rx pin to Arduino pin 2
(Serves as Rx) (Serves as Tx)

RGB LED

- * Connect the Common Cathode (longest pin) to ground.
- * Connect the red pin (right of Cathode pin) to PWM pin 9 on Arduino through a 330-ohm resistor.
- * Connect Green pin (left of Cathode pin) to PWM pin 6 on Arduino through a 330-ohm resistor
- * Connect blue pin (extreme left) to PWM pin 5 on Arduino through a 330-ohm resistor.

Working :-

We will calculate the resistance of water under test & from that we will obtain the resistivity. We have to consider the length and the cross-sectional area of our container

$$R = \rho L/A$$

$$\rho = R A/L$$

from resistivity, we can obtain conductivity

$$C = 1/\rho$$

finally, we obtain TDS from the conductivity

$$TDS = C \times 1000$$

Codes

```
#include <SoftwareSerial.h>
```

```
#include <LiquidCrystal.h>
```

```
SoftwareSerial BTSerial(3,2); // RX | TX
```

```
float reads;
```

```
int pin = A0;
```

```
float Vout = 0;
```

```
float Vin = 5;
```

```
float R1 = 1000;
```

```
float R2 = 0;
```

```
float buffer = 0;
```

```
float TPS;
```

```
float R = 0;
```

```
float r = 0;
```

```
float L = 0.06;
```

```
double A = 0.000154;
```

-float c=0;

-float cm=0;

int rpin=9;

int bpin=5;

int gpin=6;

int rval=255;

int brval=255;

int gval=255;

LiquidCrystal lcd(7,8,10,11,12,13);

void setup()

{

Serial.begin(9600);

BTSerial.begin(9600);

lcd.begin(16,2);

pinMode(rpin, OUTPUT);

pinMode(bpin, OUTPUT);

pinMode(gpin, OUTPUT);

pinMode(rpin, INPUT);

lcd.print("Conductivity:");

}

void loop()

{

reads = analogRead(A0);

vout = reads * 5 / 1023;

Serial.println(reads);

buffer = (VIN / Vout) - 1;

R2 = R1 * buffer;

Serial.println(R2);

delay(500);

$r = B_2 \cdot A / L_3$

$C = 1/13$

$cm = C \cdot 10$

$TDS = cm \cdot 700$

$led.setcursor(0,1);$

$led.println(C);$

$if(reads < 600)$

{
 $if(reads <= 300)$

 {
 $SetColor(255,0,255);$

 }

$if(reads > 200)$

 {
 $SetColor(200,0,255);$

 }

}

else {

$if(reads <= 900)$

 {
 $SetColor(0,0,255);$

 }

$if(reads > 700)$

 {
 $SetColor(0,255,255);$

 }

~~$BTSerial.print(C);$~~

~~$BTSerial.print("\n");$~~

$BTSerial.print(TDS);$

$BTSerial.print("\n");$

$delay(500);$

}

void Setcolor (int red, int green, int blue)

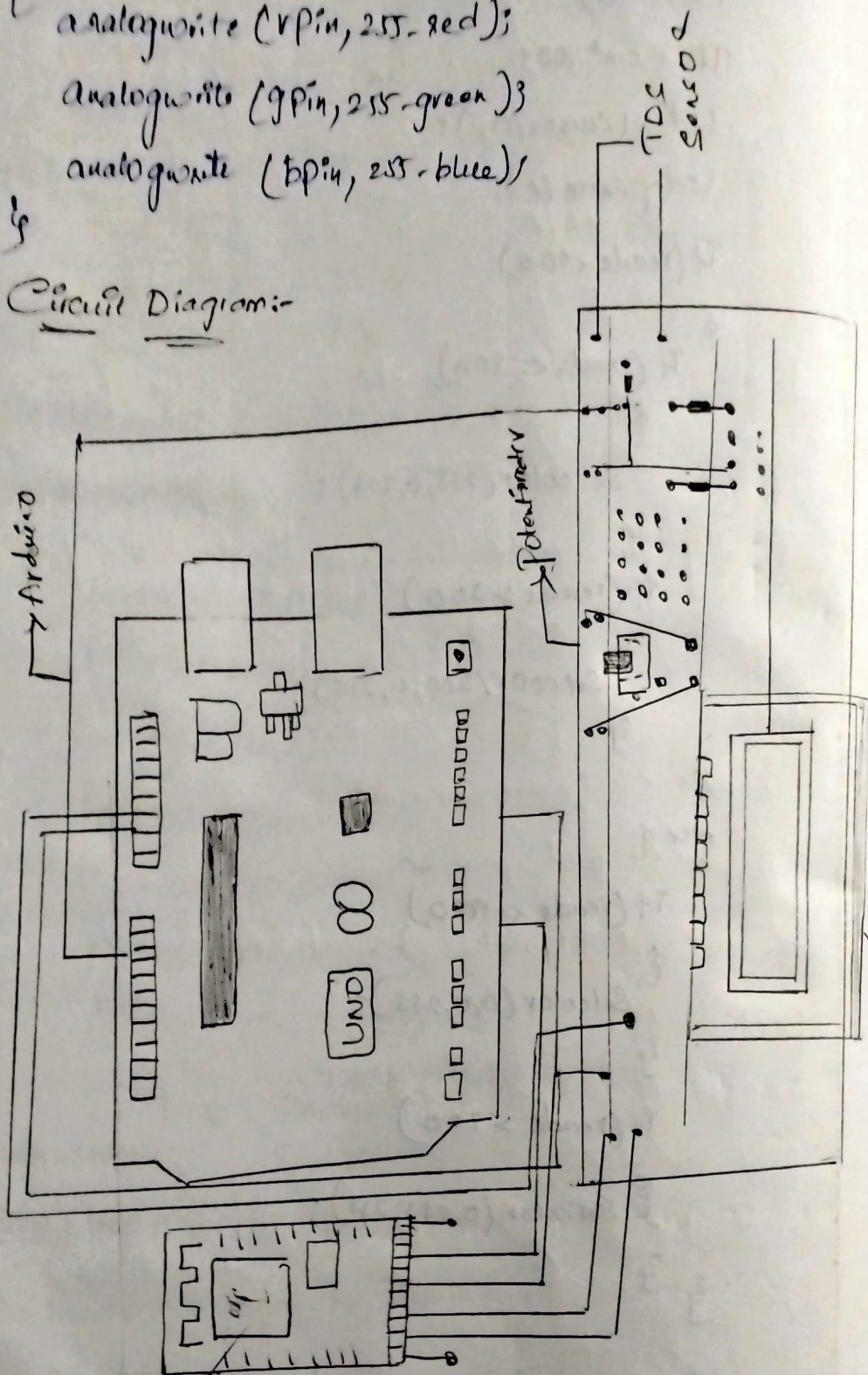
95 analogwrite (rpin, 255-red);

analogwrite (gpin, 255-green);

analogwrite (bpin, 255-blue);

5

Circuit Diagram:-



Q
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Hicos
Bluetech