Lab 4

ICS423 - Internet of Things

Jayant Kolapkar - 2021BCS0132

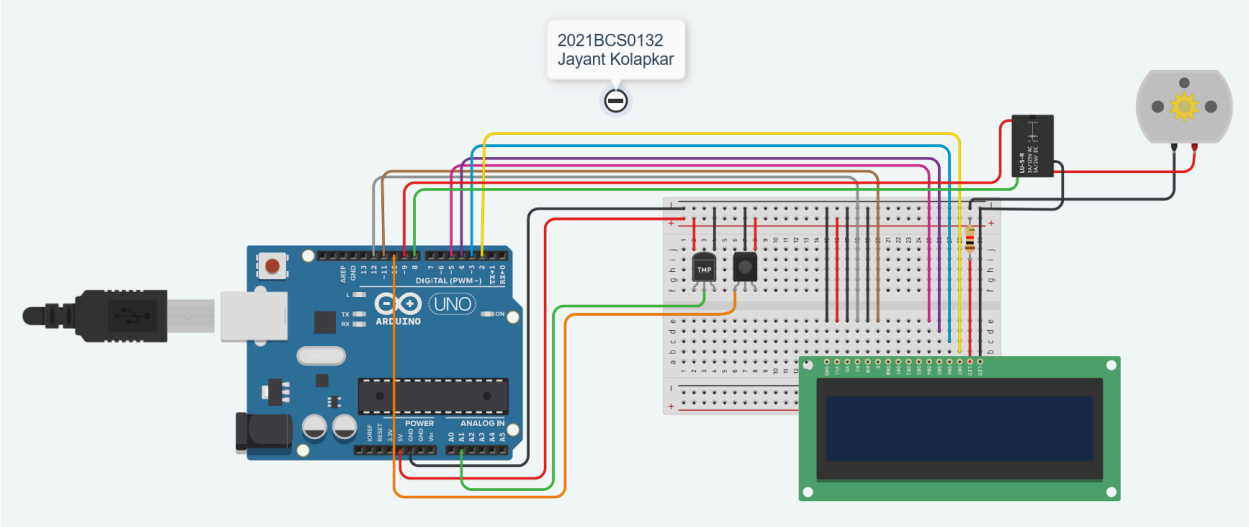
Question

Task 1: Assume that three blades of a fan are connected to a rotary motor. Design an IoT system that automatically controls the speed of the fan based on the input temperature.

Task 2: Assume a DC motor is used to pump water. Design an irrigation system that pumps water to three water channels based on the soil moisture content of those locations.

Task 1

Diagram



Code

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

float temp;
int tempPin = A1;
```

```
int relayPin = 8;

#define fan 9

void setup(){
  pinMode(fan, OUTPUT);
    pinMode(relayPin, OUTPUT);

    lcd.begin(16, 3);

    lcd.setCursor(1, 1);
    lcd.print("2021BCS0132");
    delay(1000);
    lcd.clear();
    lcd.setCursor(3,0);
    lcd.print("Jayant Kolapkar");
    delay(1000);
    lcd.clear();
    lcd.print("AUTO TEMPERATURE");
    delay(2000);
    lcd.clear();

}

void loop()
{
  lcd.setCursor(3,0);
    lcd.print("Recording");
  lcd.setCursor(2, 1);
  lcd.print("Temperature..");
  delay(3000);
  lcd.clear();
  lcd.setCursor(0,2);
  temp = analogRead(tempPin);
  //temp = temp*0.48828125;
  float voltage = temp * 5.0;
```

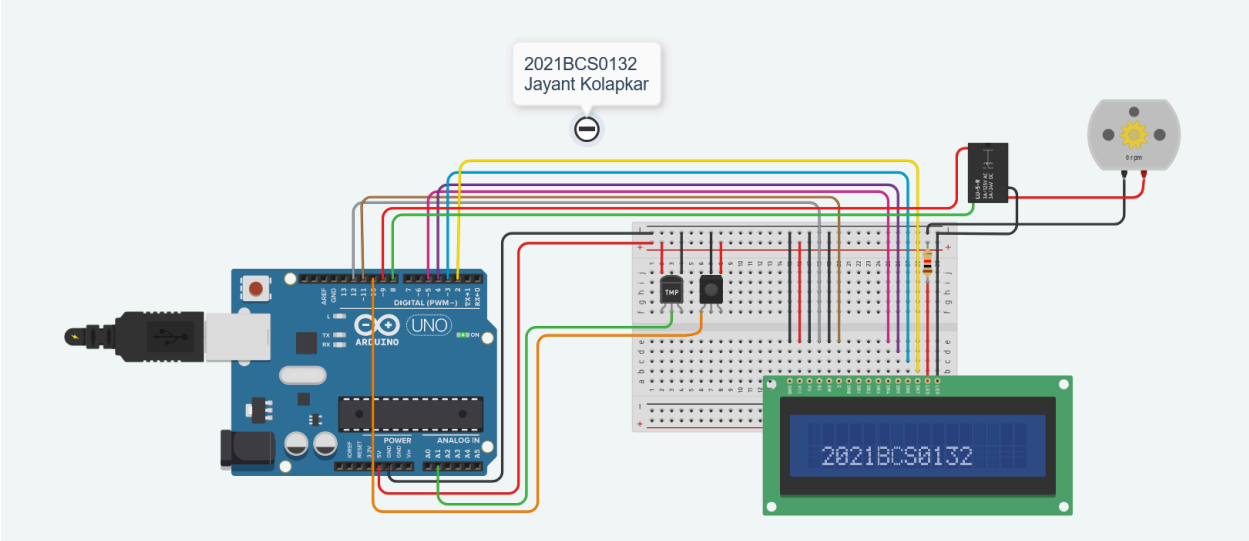
```
  voltage /= 1024.0;

  // print out the voltage
  lcd.print(voltage); lcd.println(" volts");

  // now print out the temperature
  float temperatureC = (voltage - 0.5) * 100 ;  //converting from 10 mv
per degree wit 500 mV offset
                                                //to degrees ((voltage -
500mV) times 100)

  lcd.setCursor(0, 0);
  lcd.print("Temperature = ");
  lcd.setCursor(2,1);
  //lcd.print(temp);
  lcd.print(temperatureC); lcd.println(" degrees C");
  delay(3000);
  lcd.clear();

  if(temperatureC >= 20)
  {
    poweronRelay();
    if(temperatureC >= 20 && temperatureC <= 25)
    {
      analogWrite(fan,51);
      lcd.print("Fan Speed: 20% ");
      delay(2000);
      lcd.clear();
    }
    else if(temperatureC <= 35)
    {
      analogWrite(fan,102);
      lcd.print("Fan Speed: 40% ");
      delay(2000);
      lcd.clear();
    }
```

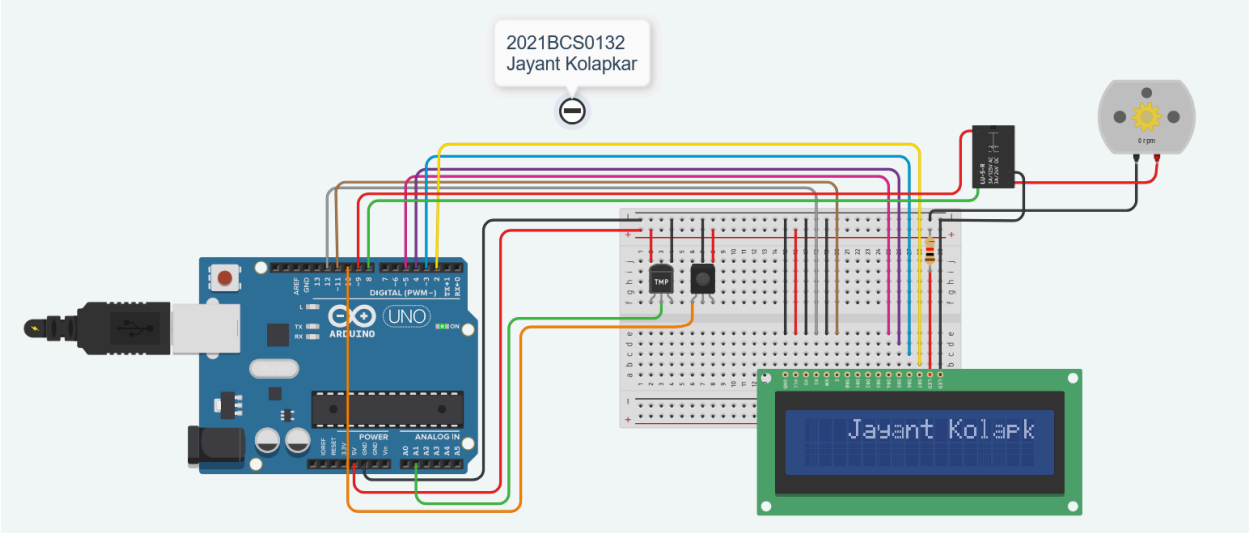
```
    else if(temperatureC <= 40)
    {
      analogWrite(fan,153);
      lcd.print("Fan Speed: 60% ");
      delay(2000);
      lcd.clear();
    }
    else if(temperatureC <= 44)
    {
      analogWrite(fan,200);
      lcd.print("Fan Speed: 80% ");
      delay(2000);
      lcd.clear();
    }
    else if(temperatureC >= 45)
    {
      analogWrite(fan,255);
      lcd.print("Fan Speed: 100% ");
      delay(2000);
      lcd.clear();
    }
  }
  else if(temperatureC < 20)
  {
    poweroffRelay();
  }


}

void poweronRelay()
  {
    digitalWrite(relayPin, HIGH);
    lcd.print("Fan ON");
    delay(2000);
    lcd.clear();
```

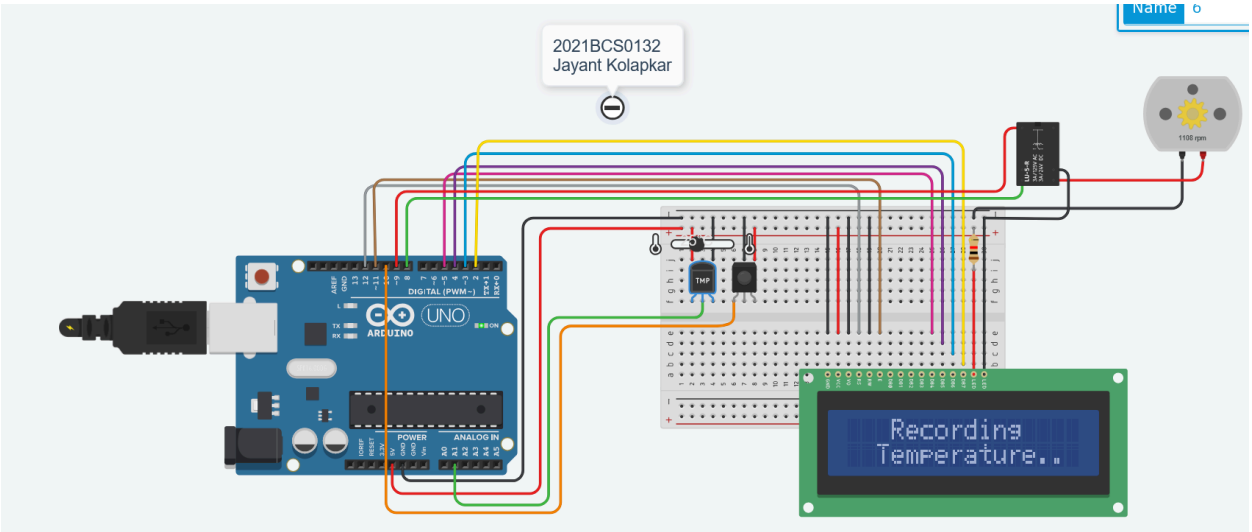
```
  }

void poweroffRelay()
  {
    digitalWrite(relayPin, LOW);
    analogWrite(fan,0);
    lcd.print("Fan OFF");
    delay(2000);
    lcd.clear();
  }
```

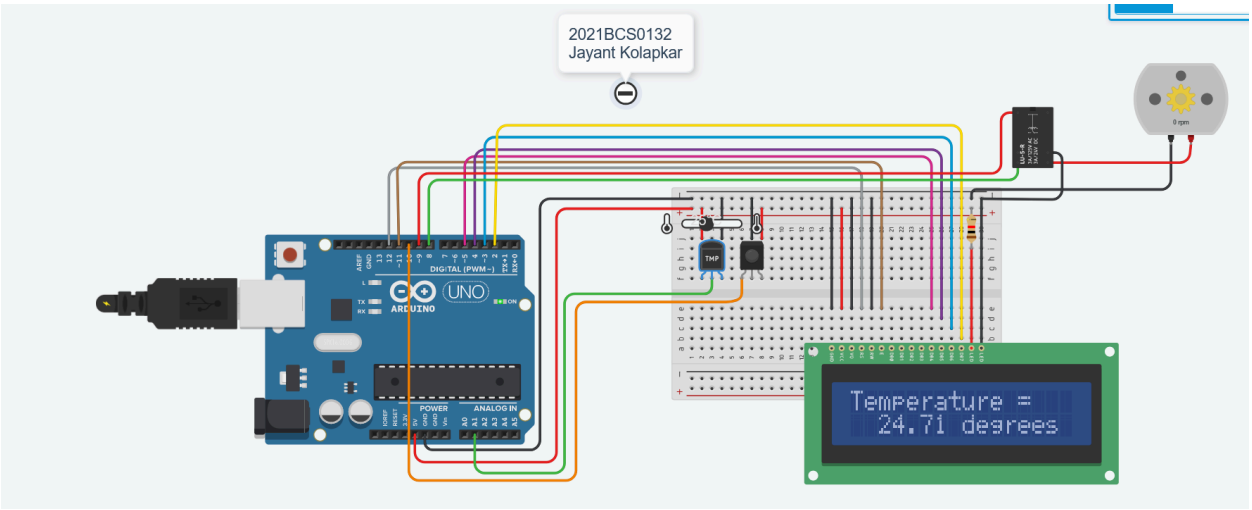
The system continuously reads temperature data from the analog sensor connected to pin A1. The raw analog values are converted into voltage, which is further translated into temperature in Celsius. The measured temperature is displayed on the LCD along with real-time updates. Based on the recorded temperature, the system adjusts the fan speed accordingly. If the temperature is **20°C or higher**, the relay is activated, and the fan is turned on with varying speeds. The fan operates at **20% speed** between **20°C and 25°C**, **40% speed** between **25°C and 35°C**, **60% speed** between **35°C and 40°C**, **80% speed** between **40°C and 44°C**, and at **full speed (100%)** for temperatures **45°C and above**. Each speed change is displayed on the LCD before being cleared for the next reading.

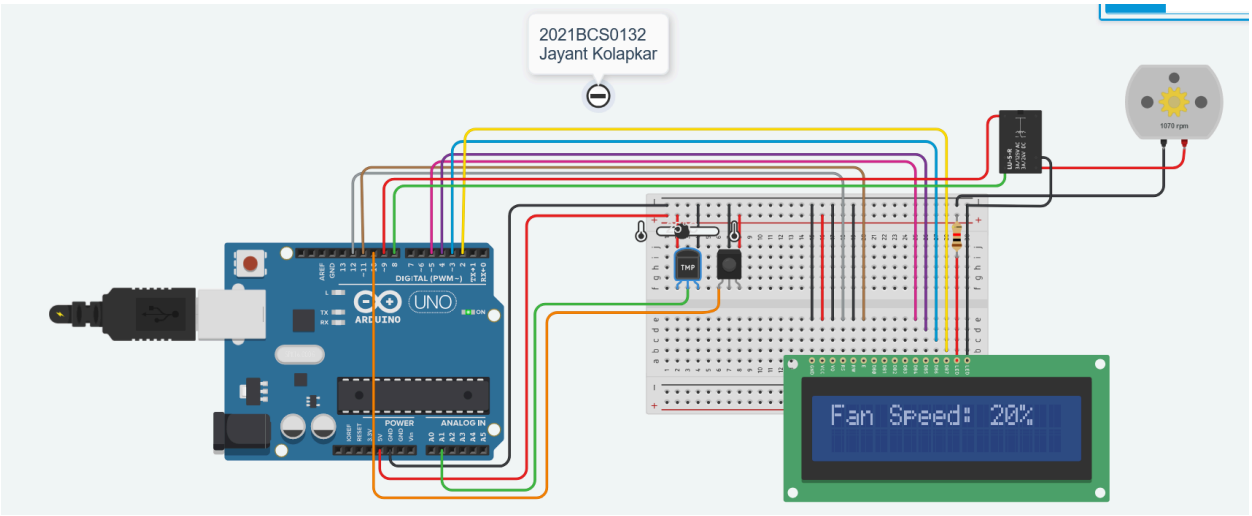
Output



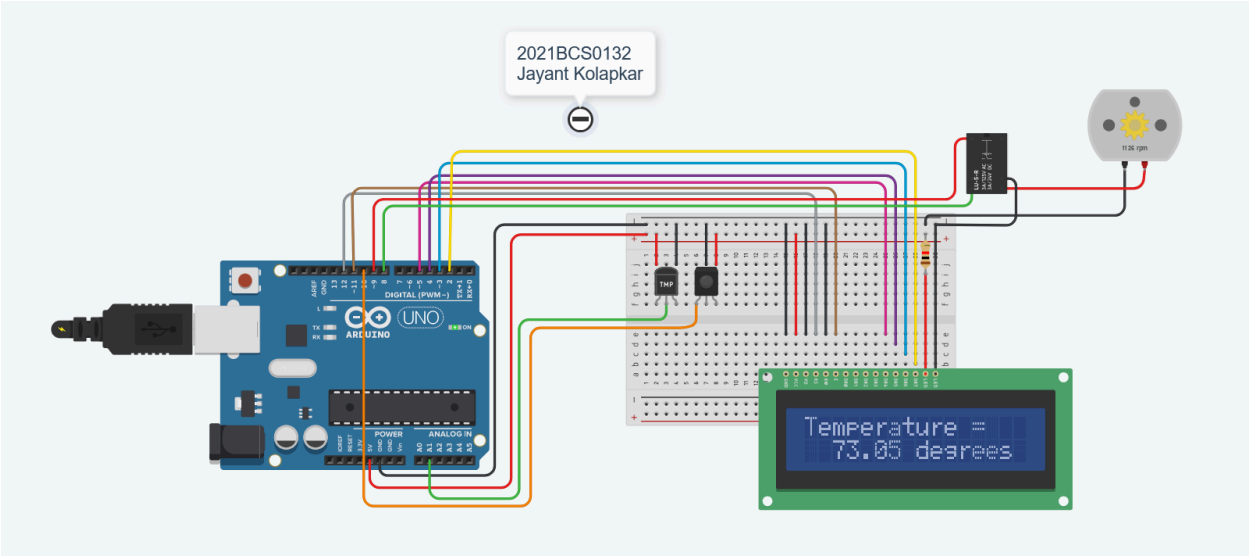

2021BCS0132
Jayant Kolapkar
Jayant Kolapk

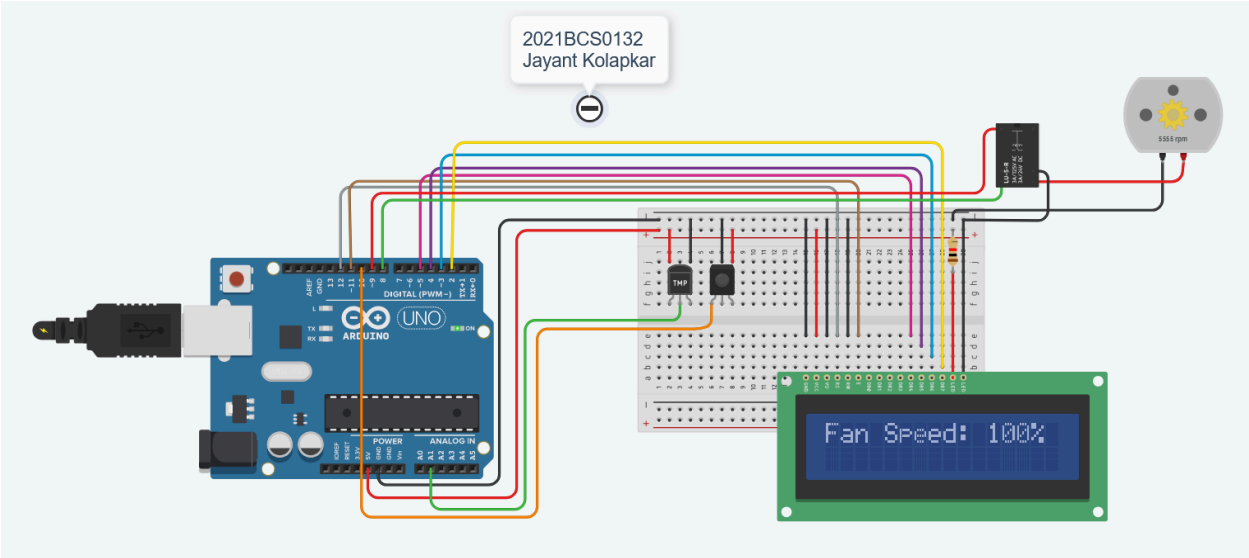

2021BCS0132
Jayant Kolapkar
Recording
Temperature..





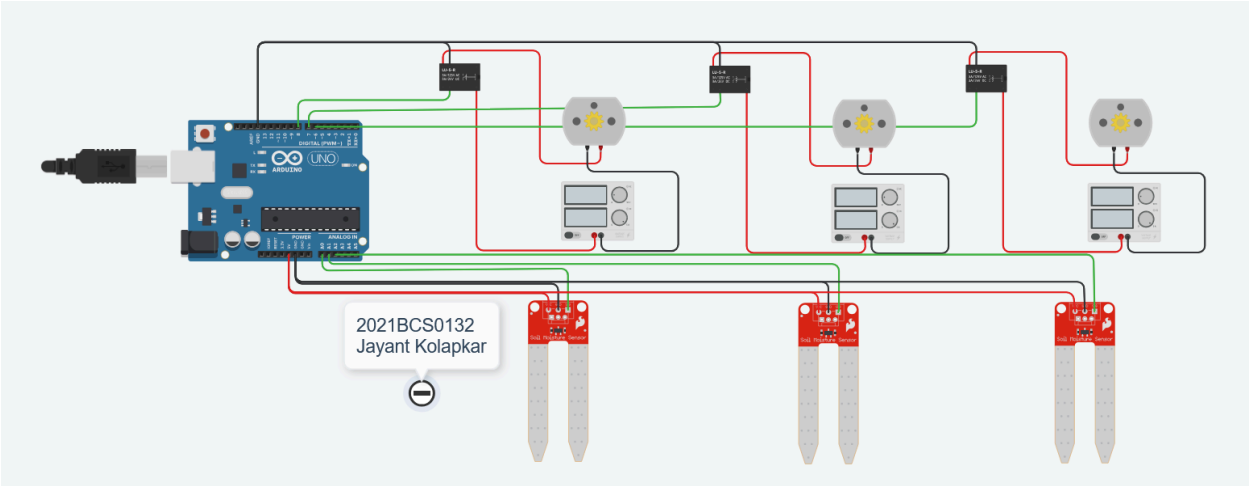
Now we change the temperature.


2021BCS0132
Jayant Kolapkar
Temperature
73.05 degrees


2021BCS0132
Jayant Kolapkar
Fan Speed: 100%

Task 2

Diagram



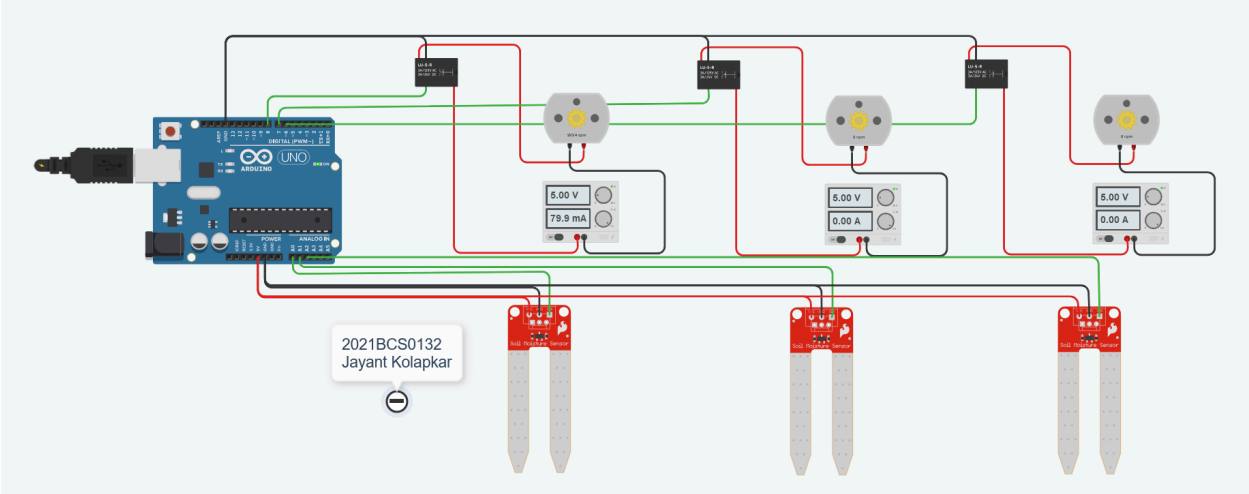
Code

```
const int moistureSensorPins[] = {A0, A1, A2}; // Moisture sensors
const int relayPins[] = {8, 7, 6};              // Relay-controlled motors
const int moistureThreshold = 300;             // Threshold for dryness

void setup() {
  Serial.begin(9600);

  for (int i = 0; i < 3; i++) {
    pinMode(relayPins[i], OUTPUT);
    digitalWrite(relayPins[i], LOW); // Ensure motors are off initially
  }
}

void loop() {
  for (int i = 0; i < 3; i++) {
    int moistureLevel = analogRead(moistureSensorPins[i]);
    Serial.print("Soil Moisture Level (Sensor ");
    Serial.print(i + 1);
    Serial.print("): ");
```

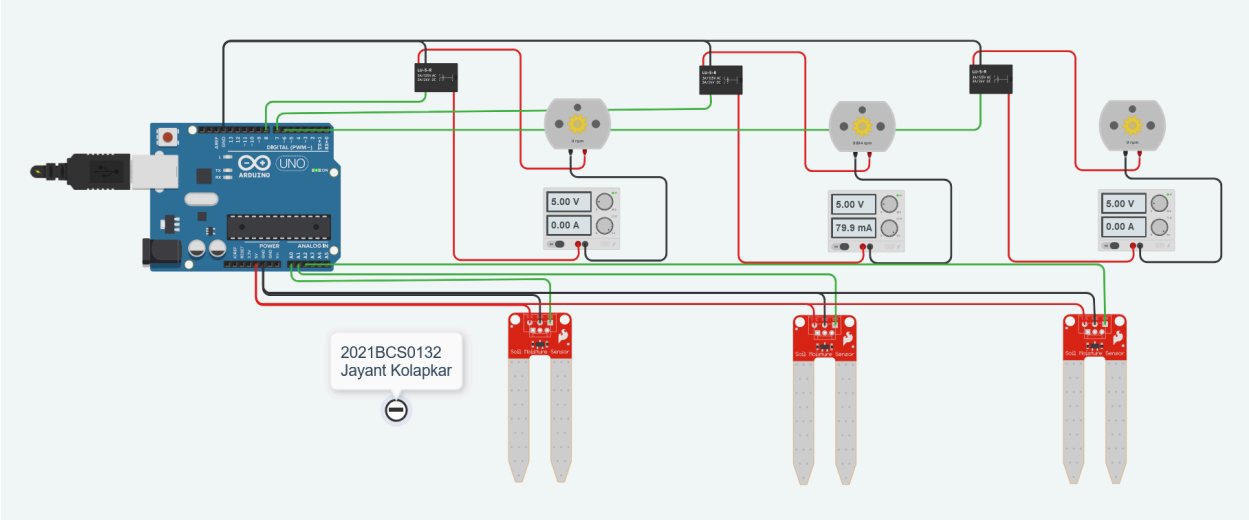
```
    Serial.println(moistureLevel);

    if (moistureLevel < moistureThreshold) {
      Serial.print("Soil is dry at Sensor ");
      Serial.print(i + 1);
      Serial.println("! Watering the plant...");
      digitalWrite(relayPins[i], HIGH);
      delay(5000);
      digitalWrite(relayPins[i], LOW);
      Serial.println("Watering complete.");
    } else {
      Serial.print("Soil moisture is sufficient at Sensor ");
      Serial.println(i + 1);
    }
  }

  delay(10000); // Wait before the next reading
}
```

This code will check the moisture levels of three sensors and activate the corresponding motor if the soil is too dry. Each motor runs independently for 5 seconds when needed, and the system waits 10 seconds before checking again.

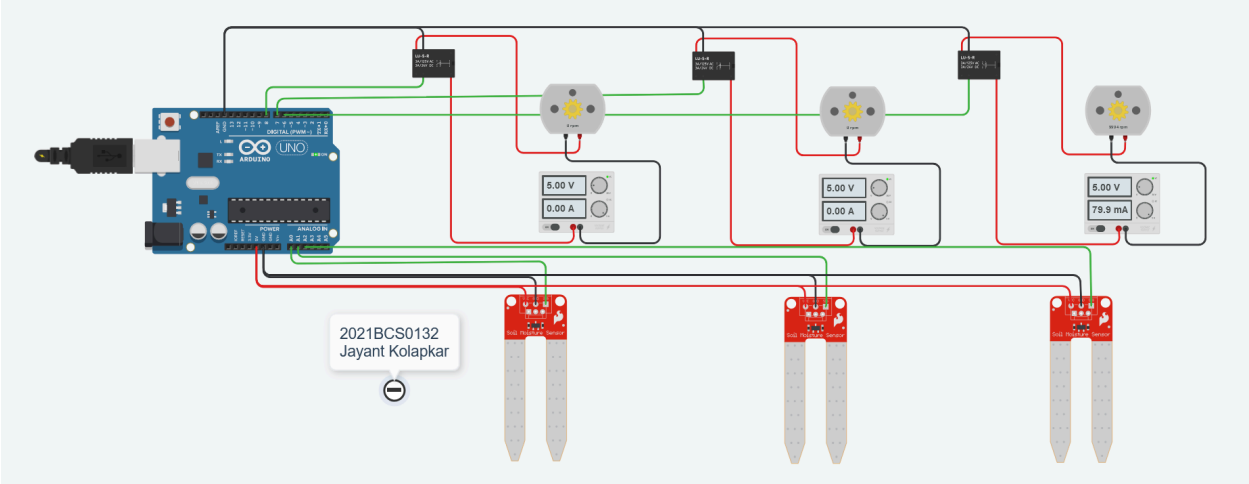
Output



First motor runs as it's soil moisture level is low.



Then the 2nd sensor is checked and the motor is run.



At last the 3rd sensor is checked and the motor is run.

The loop then repeats infinitely, and if the soil moisture level is sufficient, that channel is skipped.