IOT HOLIDAY ASSIGNMENT

1) Write a Embeded C program to Create a Weather Reporting System that provides real-time environmental data to users.

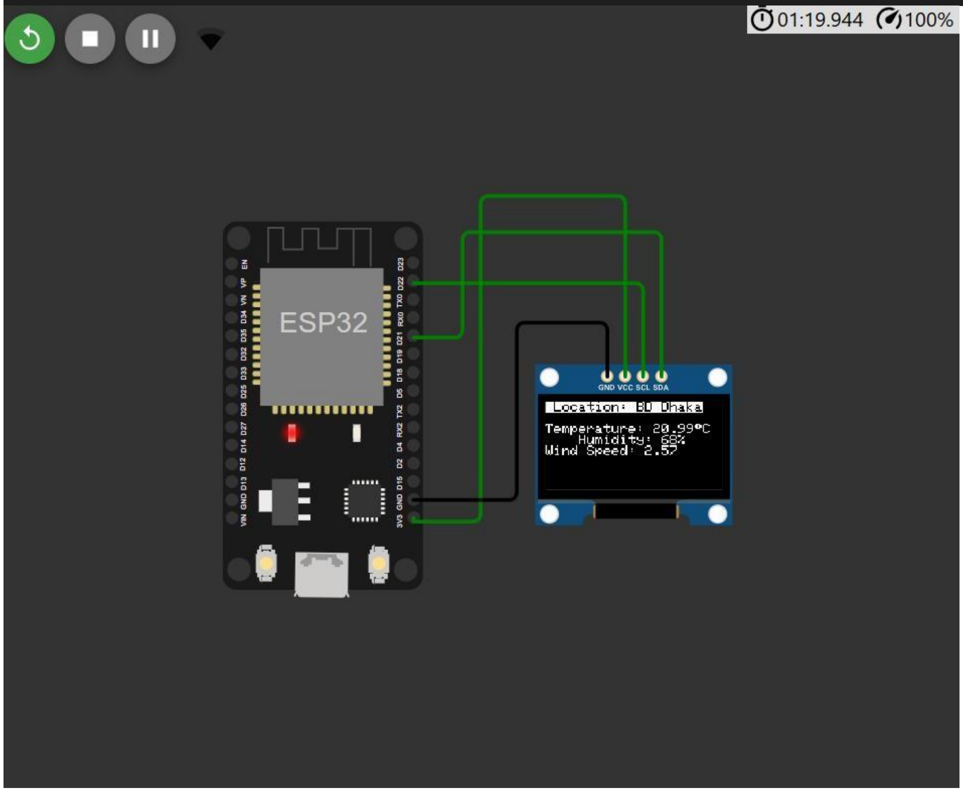
```
#include <Wire.h>
#include <WiFi.h>
#include <ArduinoJson.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>
#include <ThingSpeak.h>

#define SCREEN_WIDTH 128
#define SCREEN_HEIGHT 64
```

```
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);
```

```
const char* ssid = "Wokwi-GUEST";
const char* password = "";
String APIKEY = "8c9f6eac52a56ea89b8c36162a6d60c7";
String CityID = "1185241"; // Example City ID
WiFiClient client;
char servername[] = "api.openweathermap.org";
String result;
unsigned long channelID = 2235258; const
char* writeAPIKey = "IU90PCW31HECJ1V5";
```

```
void setup() {
  Serial.begin(115200);

  WiFi.mode(WIFI_STA);
  WiFi.begin(ssid, password);

  display.begin(SSD1306_SWITCHCAPVCC, 0x3C);
  delay(200); display.clearDisplay();
  display.setTextSize(1);
  display.setTextColor(SSD1306_WHITE);
  display.setCursor(0, 0);
  display.print("Connecting...");
  display.display();

  while (WiFi.status() != WL_CONNECTED) {
    delay(500); Serial.print(".");
    display.print(".");
    display.display();
  }


  display.clearDisplay();
  display.setCursor(0, 0);
  display.println("Connected to WiFi");
  display.display(); delay(1000);
  display.clearDisplay();
}

void loop() {
```

```
if (client.connect(servername, 80)) { client.println("GET /data/2.5/weather?id=" + CityID
  + "&units=metric&APPID=" + APIKEY); client.println("Host: api.openweathermap.org");
  client.println("User-Agent: ArduinoWiFi/1.1"); client.println("Connection: close");
  client.println();
} else {
  Serial.println("connection failed");
  Serial.println();
}


while (client.connected() && !client.available()) delay(1);

while (client.connected() || client.available()) {
char c = client.read(); result = result + c;
}

client.stop();

// Parse JSON
DynamicJsonDocument doc(1024);
deserializeJson(doc, result);

String location = doc["name"]; String country =
doc["sys"]["country"]; float temperature =
doc["main"]["temp"].as<float>(); int humidity =
doc["main"]["humidity"]; float windSpeed =
doc["wind"]["speed"].as<float>();
// Send data to ThingSpeak
ThingSpeak.begin(client);
ThingSpeak.setField(1, temperature);
ThingSpeak.setField(2, humidity); ThingSpeak.setField(3,
windSpeed); int httpCode = ThingSpeak.writeFields(channelID,
writeAPIKey); if (httpCode == 200) {
  Serial.println("Data sent to ThingSpeak successfully");
} else {
  Serial.print("Error sending data to ThingSpeak. HTTP code: ");
  Serial.println(httpCode);
}
Serial.println();
Serial.print("Country: ");
Serial.println(country);
Serial.print("Location: ");
Serial.println(location);
Serial.print("Location ID: ");
Serial.println(CityID); // Print the City ID you used
Serial.printf("Temperature: %.2f°C\r\n", temperature);
Serial.printf("Humidity: %d %%\r\n", humidity);
Serial.printf("Wind speed: %.2f m/s\r\n", windSpeed);

display.clearDisplay(); display.setCursor(0, 0);
display.setTextColor(SSD1306_BLACK, SSD1306_WHITE);
display.print(" Location: ");
display.print(country); display.print(" ");
display.println(location);

display.println(); display.setTextColor(SSD1306_WHITE, SSD1306_BLACK);
display.print("Temperature: "); display.print(temperature, 2); display.print((char)247);
display.print("C ");
display.print("Humidity: "); display.print(humidity); display.println("%
"); display.print("Wind Speed: "); display.print(windSpeed, 2);






  display.display();

  delay(60000); // 1 minute delay
}
```


01:19.944 100%

```
Location: BD Dhaka

Temperature: 20.99°C
    Humidity: 68%
Wind Speed: 2.57
```

2) Write a Embeded C program to Create a Home Automation System that simpllifies daily routines(Any 2 devices) by controlling devices remotely.

```
// Home Automation System
// Thingspeak Server dB Public View: https://thingspeak.com/channels/2052162
```

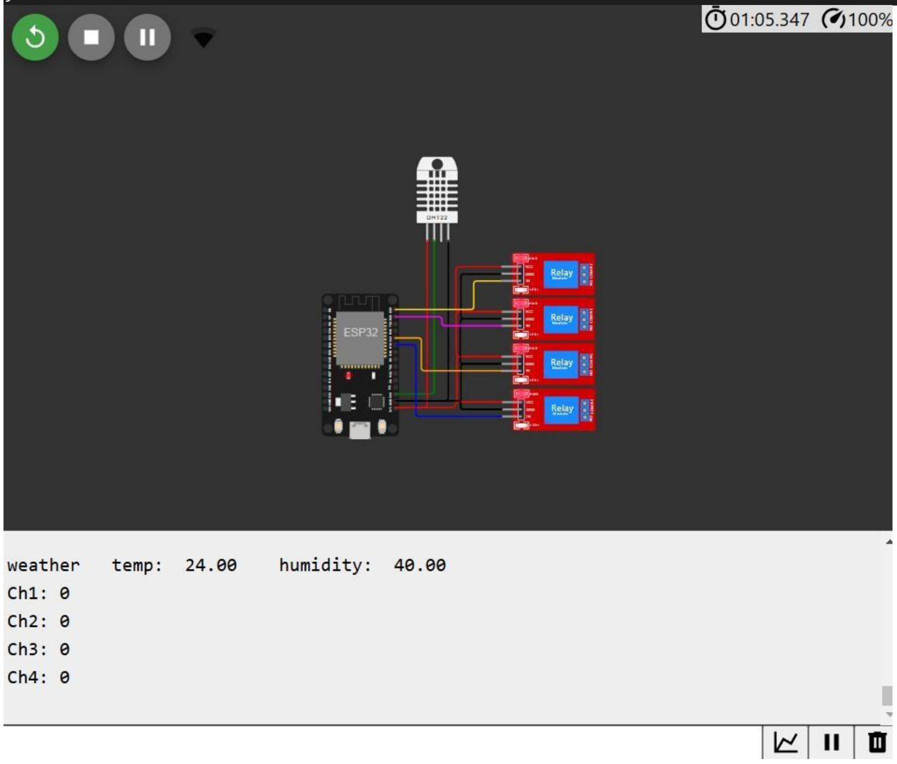
```
#include <DHT.h>
#define DHTPIN 15
#define DHTTYPE DHT22
DHT dht(DHTPIN, DHTTYPE);
```

```
#include <WiFi.h>
#include "ThingSpeak.h" // always include thingspeak header file
after other header files and custom macros
char ssid[] = "Wokwi-GUEST"; // your network SSID (name) char
pass[] = ""; // your network password
int keyIndex = 0;            // your network key Index number (needed only for WEP)
WiFiClient client;
// Weather station channel details unsigned long
weatherStationChannelNumber = 2052162; unsigned
long myChannelNumber = 2052162; const char *
myWriteAPIKey = "QS963Q0GCOTDY6GY";
// Timer variables unsigned long
lastTime = 0; unsigned long
timerDelay = 30000;
```

```
int            = 0;
statusCode
int field[8]   {1,2,3,4};
=
int ch1 = 0;
int ch2 = 0;
int ch3 = 0;
int ch4 = 0;
```

```
#define ch1Pin 23
#define ch2Pin 22
#define ch3Pin 21 #define ch4Pin 19 float
Prevtemp = 0;
void setup() {
  Serial.begin(115200);      // Initialize serial
  // Pin Mode declaration
  pinMode(ch1Pin, OUTPUT);
  pinMode(ch2Pin, OUTPUT);
  pinMode(ch3Pin, OUTPUT);
  pinMode(ch4Pin, OUTPUT);
  dht.begin();
  while (!Serial) { ;} // wait for serial port to connect. Needed for Leonardo native USB
port only
// WiFi.mode(WIFI_STA);
  ThingSpeak.begin(client); // Initialize ThingSpeak
// Connect or reconnect to WiFi if(WiFi.status()
!= WL_CONNECTED){
  Serial.print("Attempting to connect to SSID: ");
  Serial.println("Wokwi");
```

```
    while(WiFi.status() != WL_CONNECTED){
      WiFi.begin(ssid, pass); // Connect to WPA/WPA2 network. Change this line if using open
or WEP network
      Serial.print("."); delay(5000);
    }
    Serial.println("WiFi Connected"); delay(1000);
  }
  Serial.println("Welcome at Smart Home"); delay(1000);
}



void loop() {
    // use ThingSpeak.readMultipleFields(channelNumber, readAPIKey) for private channels
    statusCode = ThingSpeak.readMultipleFields(weatherStationChannelNumber);

    if(statusCode == 200)
    {
      // Fetch the stored data ch1 =
      ThingSpeak.getFieldAsInt(field[0]); // Field 1 ch2 =
      ThingSpeak.getFieldAsInt(field[1]); // Field 2 ch3 =
      ThingSpeak.getFieldAsInt(field[2]); // Field 3 ch4 =
      ThingSpeak.getFieldAsInt(field[3]); // Field 4
    } else{Serial.println("Problem reading channel. HTTP error code " +
    String(statusCode));}
    float  temp  =  dht.readTemperature();
    float  humidity  =  dht.readHumidity();
    Serial.print("weather      ");      if
    (isnan(temp)  ||  isnan(humidity))  {
    Serial.println("Failed to read from
                                      DHT sensor!");
      return;
    }
     String message = "temp: " + String(temp) + "      humidity: " + String(humidity);
    Serial.println(message);
    delay(500);
if (temp >= 35){
  ch1 = 1;
} else{
  ch1 = 0;
}

    Serial.println("Ch1: " + String(ch1));
    Serial.println("Ch2: " + String(ch2));
    Serial.println("Ch3: " + String(ch3));
    Serial.println("Ch4: " + String(ch4));

    //   Hardware   Control   if   (ch1   >=   1){digitalWrite(ch1Pin,   HIGH);}   if   (ch1   ==
    0){digitalWrite(ch1Pin, LOW);}
    if (ch2 >= 1){digitalWrite(ch2Pin, HIGH);}

    if (ch2 == 0){digitalWrite(ch2Pin, LOW);}


    if (ch3 >= 1){digitalWrite(ch3Pin, HIGH);}

    if (ch3 == 0){digitalWrite(ch3Pin, LOW);}
    if (ch4 >= 1){digitalWrite(ch4Pin, HIGH);}
    if (ch4 == 0){digitalWrite(ch4Pin, LOW);}
    if (temp != Prevtemp){
          Prevtemp = temp;
          // Serial.println(temp); //
          Serial.println(Prevtemp);
          //    upload data:
          ThingSpeak.setField(1, ch1);
          ThingSpeak.setField(2, ch2);
          ThingSpeak.setField(3, ch3);
          ThingSpeak.setField(4, ch4);
          ThingSpeak.setField(5, temp);
          ThingSpeak.setField(6, humidity);

          // Write to ThingSpeak. int x =
          ThingSpeak.writeFields(myChannelNumber, myWriteAPIKey);

          if(x == 200){
            Serial.println("Channel update successful.");
          }
          else{
            Serial.println("Problem updating channel. HTTP error code " + String(x));
          }
        }

        Serial.println(); delay(6000); // no need
        to fetch too often

}
```



```
weather   temp:  24.00    humidity:  40.00
Ch1: 0
Ch2: 0
Ch3: 0
Ch4: 0
```

3) Write a Embedded C program to Create an Air Pollution Monitoring System that tracks air quality levels in real-time to ensure a healthier environment.

```
//Air Pollution Monitoring System
#define name value#define BLYNK_TEMPLATE_ID "TMPL6kWN92xgM" #define
BLYNK_TEMPLATE_NAME "Automated Air purifier"
```

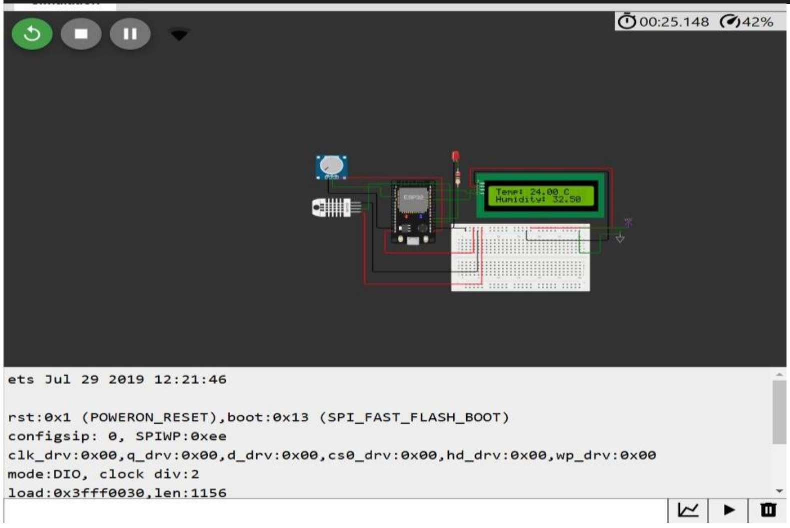
```
#define BLYNK_AUTH_TOKEN "29-TfEOHXuD37x_ERtbiYVxHfZMiodqj"

#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <Adafruit_Sensor.h>
#include <DHT.h>
#include <BlynkSimpleEsp32.h>
#include <WiFi.h>
```

```
// Define the pins for the DHT22 sensor
#define DHTPIN 2 // Replace with the actual pin connected to DHT22
#define DHTTYPE DHT22
DHT dht(DHTPIN, DHTTYPE);
LiquidCrystal_I2C lcd(0x27, 16, 2); //  0x27 is the I2C address of the LCD
const int potPin = 34; // Replace with  the actual pin connected to the potentiometer
const int ledPin = 4; // Replace with   the actual pin connected to the LED


char ssid[] = "Wokwi-GUEST";
char pass[] = "";


BlynkTimer timer;

void sendData() {
  // Read temperature and humidity from the DHT22 sensor
  float temperature = dht.readTemperature(); float
  humidity = dht.readHumidity();
  // Read gas value from the potentiometer
  int gasValue = analogRead(potPin);
  // Send data to Blynk
  Blynk.virtualWrite(V1, temperature);
  Blynk.virtualWrite(V2, humidity);
  Blynk.virtualWrite(V3, gasValue);
}
void displayMessage(String line1, String line2, int delayTime = 2000) {
lcd.clear(); lcd.setCursor(0, 0); lcd.print(line1); lcd.setCursor(0,
1); lcd.print(line2); delay(delayTime);
}
void setup() {
  // Initialize the LCD
  lcd.init();
  lcd.backlight();
  // Initialize DHT sensor
  dht.begin();

  // Initialize the LED pin
  pinMode(ledPin, OUTPUT); // Connect to
  Wi-Fi WiFi.begin(ssid, pass); while
  (WiFi.status() != WL_CONNECTED) {
    delay(250);
  }

  // Initialize Blynk
  Blynk.begin(BLYNK_AUTH_TOKEN, ssid, pass);

  // Map virtual pins
  Blynk.virtualWrite(V1, 0); // Initialize with 0
  Blynk.virtualWrite(V2, 0); // Initialize with 0
```

```
 Blynk.virtualWrite(V3, 0); // Initialize with 0
  // Setup a function to be called every 5 seconds
  timer.setInterval(3000L, sendData);
}
void loop() {
  Blynk.run();
  timer.run();

 // Read temperature and humidity from the DHT22 sensor
 float temperature = dht.readTemperature(); float
 humidity = dht.readHumidity();

 // Read gas value from the potentiometer
 int gasValue = analogRead(potPin);

 // Determine air level based on the specified conditions
 String airLevel;
  // Check temperature and humidity conditions if ((temperature >= 22 && temperature
  <= 30) && (humidity > 30 && humidity < 60)) { airLevel = "Good";
  } else if ((temperature >= 30 && temperature <= 40) && (humidity >= 60 && humidity <= 70)) {
    airLevel = "Normal";
  } else { airLevel =
    "Bad";
  }

 // Determine gas level based on the criteria
 String gasLevel;
  if (gasValue >= 0 && gasValue <= 1364) {
    gasLevel = "Good";
  } else if (gasValue >= 1365 && gasValue <= 2730) {
    gasLevel = "Normal";
  } else { gasLevel =
    "Bad";
  }
 // Determine air quality based on the criteria
 String airQuality;
  if ((airLevel == "Good" || airLevel == "Normal") && (gasLevel == "Good" || gasLevel ==
"Normal")) { airQuality = "Good Air
    Quality";
  } else { airQuality = "Bad Air
    Quality";
  }
 // Display temperature and humidity on the LCD lcd.clear();
 lcd.setCursor(0, 0); lcd.print("Temp: " + String(temperature)
 + " C"); lcd.setCursor(0, 1); lcd.print("Humidity: " +
 String(humidity) + " %"); delay(2000); // Display temperature
 and humidity for 2 seconds

 // Display air level on the LCD lcd.clear();
 lcd.setCursor(0, 0); lcd.print("Air Level: " +
 airLevel); delay(2000); // Display air level
 for 2 seconds

 // Display gas level and gas value on the LCD
 lcd.clear(); lcd.setCursor(0, 0); lcd.print("Gas Level: "
 + gasLevel); lcd.setCursor(0, 1); lcd.print("Gas Value: "
 + String(gasValue)); delay(2000); // Display gas level
 and value for 2 seconds
```

```
// Display air quality on the LCD lcd.clear();
lcd.setCursor(0, 0); lcd.print("Air Quality: ");
lcd.setCursor(0, 1); lcd.print(airQuality);
delay(2000); // Display air quality for 2 seconds
```

```
  // Control the LED based on air quality if
  (airQuality == "Bad Air Quality") {
  digitalWrite(ledPin, HIGH); // Turn on the LED
  } else { digitalWrite(ledPin, LOW); // Turn off
  the LED }
}
```



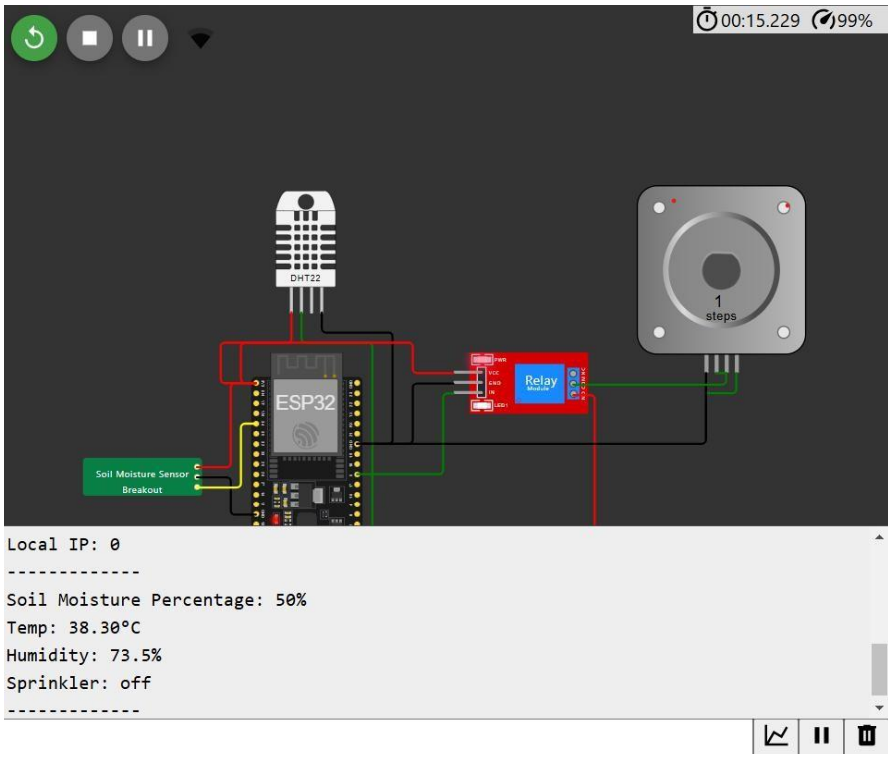
```
ets Jul 29 2019 12:21:46

rst:0x1 (POWERON_RESET),boot:0x13 (SPI_FAST_FLASH_BOOT)
configsip: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
mode:DIO, clock div:2
load:0x3fff0030,len:1156
```

4) Write a Embedded C program to Create an IOT-based Smart Irrigation System for Agriculture that Automates Watering based on weather and Soil Conditions.

```
// IoT-based Irrigation System for ThingSpeak
// Based on ESP32 WOKWI Simulator by ThinkIOT
// ThingSpeak channel can be found here: https://thingspeak.com/channels/2383114

#include <WiFi.h>
#include "ThingSpeak.h"
#include "DHTesp.h"
const int SOIL_MOISTURE_PIN = 34; const int
SPRINKLER_CONTROL_PIN = 5; const int DHT_PIN = 15;
DHTesp dhtSensor;
```

```
int MOISTURE_THRESHOLD_LOW = 15;            // Set Activation threshold in percentage

int MOISTURE_THRESHOLD_HIGH = 55; bool      // Set Deactivation threshold in percentage
SPRINKLER_ACTIVATION_STATUS = false;
char* WIFI_NAME = "Wokwi-GUEST";
char* WIFI_PASSWORD = ""; int
myChannelNumber = 2546422;
                                            // ThingSpeak channel ID
char* myApiKey = "54NGG6QX49UBG6O1";        // ThingSpeak channel write API key
WiFiClient client;
```

```
void setup()
{
  Serial.begin(115200);
  dhtSensor.setup(DHT_PIN, DHTesp::DHT22);
  WiFi.begin(WIFI_NAME, WIFI_PASSWORD);
  Serial.println("Connecting...");
  Serial.println("Wi-Fi connected");
  Serial.println("Local IP: " + String(WiFi.localIP()));
  Serial.println("-------------");
  WiFi.mode(WIFI_STA);
  ThingSpeak.begin(client);
  pinMode(SPRINKLER_CONTROL_PIN, OUTPUT);
}
void loop()
{ int soilMoisturePercentage = map(analogRead(SOIL_MOISTURE_PIN), 0, 4095, 0, 100);
  TempAndHumidity data = dhtSensor.getTempAndHumidity();
  ThingSpeak.setField(2,data.temperature);
  ThingSpeak.setField(3,data.humidity);

if ( soilMoisturePercentage < MOISTURE_THRESHOLD_LOW){ SPRINKLER_ACTIVATION_STATUS = true;
  digitalWrite(SPRINKLER_CONTROL_PIN, HIGH); //
}else{
  SPRINKLER_ACTIVATION_STATUS = false; digitalWrite(SPRINKLER_CONTROL_PIN, LOW); // Turn off
sprinkler and LED }

// Print status
Serial.print("Soil Moisture Percentage: ");
Serial.print(soilMoisturePercentage);
Serial.println("%");


 Serial.println("Temp: " + String(data.temperature, 2) + "°C");
 Serial.println("Humidity: " + String(data.humidity, 1) + "%");
 Serial.print("Sprinkler: ");
 Serial.println(SPRINKLER_ACTIVATION_STATUS ? "on" : "off");

 // Send data to ThingSpeak
 ThingSpeak.setField(1, soilMoisturePercentage); ThingSpeak.setField(4,
 SPRINKLER_ACTIVATION_STATUS);

 int x = ThingSpeak.writeFields(myChannelNumber, myApiKey);

  Serial.println("-------------");
  delay(15000); // Thingspeak allows for an update every 15 seconds
}
```



```
Local IP: 0
-------------
Soil Moisture Percentage: 50%
Temp: 38.30°C
Humidity: 73.5%
Sprinkler: off
-------------
```

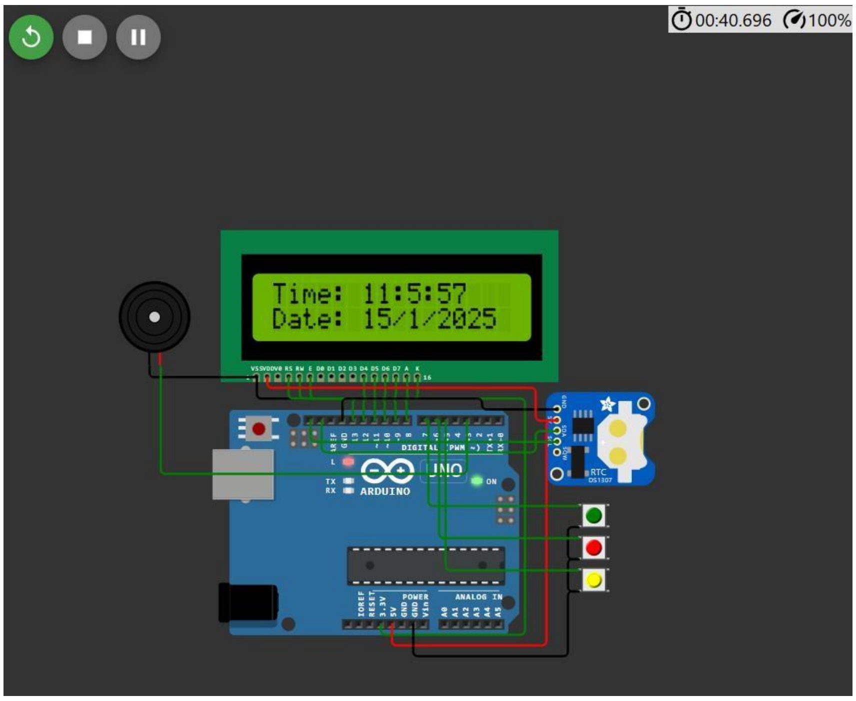
5) Write a Emedded C Program to Create a Smart Alarm Clock that adjusts to your schedule and Environment,Waking you up intelligently. /* ----- C Program for Arduino based Alarm Clock ---- */

```
#include <Wire.h>

#include<EEPROM.h>

#include <RTClib.h>

#include <LiquidCrystal.h>

const int rs = 8; const int en =
9; const int d4 = 10; const int
d5 = 11; //DISPLAY const int
d6 = 12; const int d7 = 13;

LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
RTC_DS1307 RTC;

int

temp,inc,hours1,minut,add=11;

int next=7; int INC=6; int

set_mad=5; #define buzzer 3 int

HOUR,MINUT,SECOND;



void setup()
```

```
{

Wire.begin(); RTC.begin();

lcd.begin(16,2);

pinMode(INC, INPUT);

pinMode(next, INPUT);

pinMode(set_mad, INPUT);

pinMode(buzzer, OUTPUT);

digitalWrite(next, HIGH);

digitalWrite(set_mad, HIGH);

digitalWrite(INC, HIGH);


   lcd.setCursor(0,0);

   lcd.print("Real Time Clock");

   lcd.setCursor(0,1);

   lcd.print("Circuit Digest ");

   delay(2000);


if(!RTC.isrunning())

{

 RTC.adjust(DateTime(__DATE__,__TIME__)); } }


void loop()

{ int temp=0,val=1,temp4;
   DateTime now = RTC.now();
   if(digitalRead(set_mad) == 0)      //set Alarm time

   {           lcd.setCursor(0,0);
    lcd.print("  Set  Alarm  ");
    delay(2000);       defualt();
    time();           delay(1000);
    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("  Alarm  time  ");
    lcd.setCursor(0,1);
    lcd.print(" has been set ");

    delay(2000);

 }

lcd.clear(); lcd.setCursor(0,0);

lcd.print("Time:");

lcd.setCursor(6,0);

lcd.print(HOUR=now.hour(),DEC);

lcd.print(":");

lcd.print(MINUT=now.minute(),DEC);

lcd.print(":");

lcd.print(SECOND=now.second()

,DEC); lcd.setCursor(0,1);

lcd.print("Date: ");

lcd.print(now.day(),DEC);

lcd.print("/");

lcd.print(now.month(),DEC);

lcd.print("/");

lcd.print(now.year(),DEC);
```

```
match(); delay(200); } void
defualt()
{
 lcd.setCursor(0,1);
 lcd.print(HOUR);
  lcd.print(":");
  lcd.print(MINUT);
  lcd.print(":");
  lcd.print(SECOND);
}
/*Function to set alarm time and feed time into Internal eeprom*/
void time()
{ int
 temp=1,minuts=0,hours=0,seconds=0;
 while(temp==1) {
 if(digitalRead(INC)==0)
    {
     HOUR++;
     if(HOUR==24) {

      HOUR=0;
     }
     while(digitalRead(INC)==0);
    }
    lcd.clear();
   lcd.setCursor(0,0);
   lcd.print("Set Alarm Time ");
  //lcd.print(x);
   lcd.setCursor(0,1);
   lcd.print(HOUR);
   lcd.print(":");

   lcd.print(MINUT);

   lcd.print(":");

   lcd.print(SECOND); delay(100);

   if(digitalRead(next)==0) {

   hours1=HOUR;

   EEPROM.write(add++,hours1);

   temp=2;

   while(digitalRead(next)==0);

   }

   }


   while(temp==2) {

   if(digitalRead(INC)==0)

    {

     MINUT++;
     if(MINUT==60)

     {MINUT=0;}

     while(digitalRead(INC)==0);

    }

    // lcd.clear();

   lcd.setCursor(0,1);

   lcd.print(HOUR);

   lcd.print(":");

   lcd.print(MINUT);

   lcd.print(":");

   lcd.print(SECOND); delay(100);

   if(digitalRead(next)==0) {

   minut=MINUT;

   EEPROM.write(add++, minut);
```

```
    temp=0;

    while(digitalRead(next)==0);

      } }

    delay(1000);

}

/* Function to chack medication time */

void match()

{ int tem[17]; for(int

  i=11;i<17;i++)

   {

    tem[i]=EEPROM.read(i)

    ;

   } if(HOUR == tem[11] && MINUT ==

   tem[12])

   { beep(); beep(); beep();

   beep(); lcd.clear();

   lcd.print("Wake Up........");

   lcd.setCursor(0,1);

   lcd.print("Wake Up.......");

   beep(); beep(); beep();

   beep();

   }

}

/* function to buzzer indication */

void beep()

{ digitalWrite(buzzer,HIGH);

   delay(500);

   digitalWrite(buzzer, LOW);

   delay(500);

}
```



DONE BY:
P.Mani kanta
2211CS020309
AIML-Delta