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School of Electronics Engineering

B – Tech (Electronics and Communication Engineering)Winter

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ECE3502 – IoT Domain AnalystFinal

Report

Topic: Smart Irrigation

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Slot – L31 + L32

Abstract:

The steady increasing requirement for food requires rapid development in food production technology.There is a wide range of crops and plants with different varieties. Various crops and plants have different requirements for water, fertilizers and sunlight. In a country like India, much of the economyis based on agriculture.
Water wastage is also a big concern that the world faces. Nowadays water shortage is increasing day byday as a result saving water is also a topic of concern nowadays.

Therefore smart irrigation system has been proposed and designed so that the plants or crops can besupplied with water in a proper time interval

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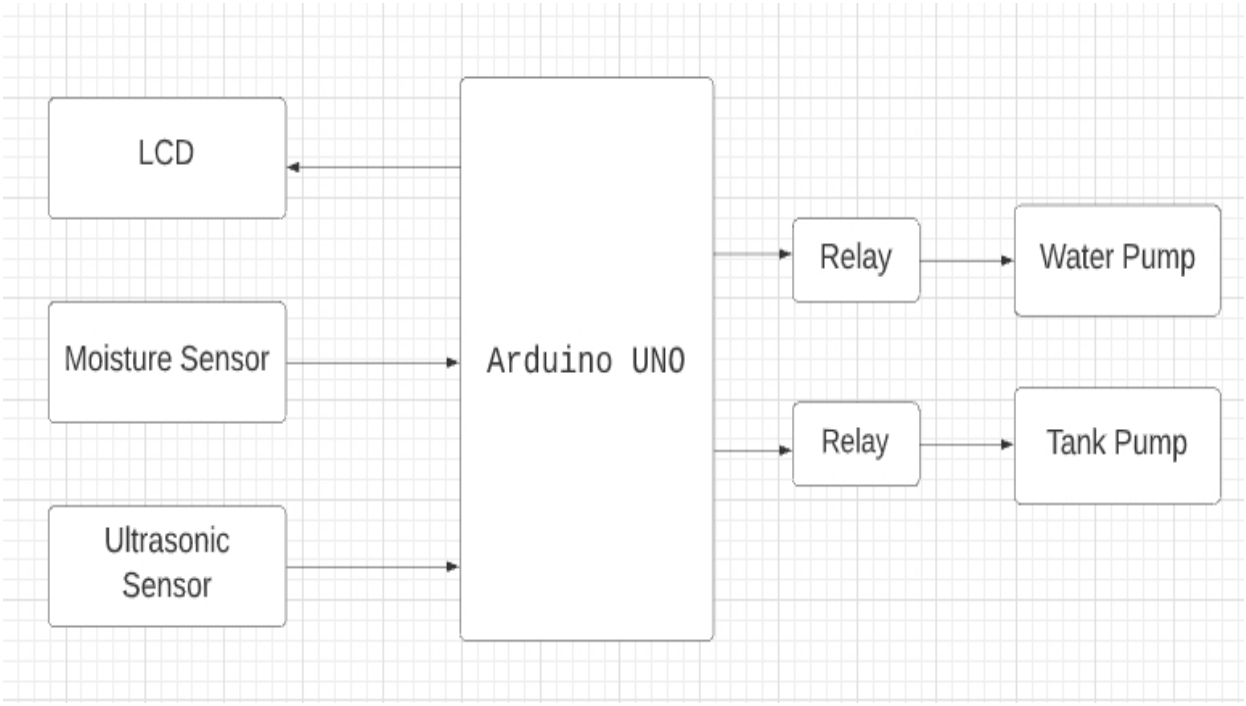
The smart irrigation system was developed to optimize water use for agricultural crops. The system hasa distributed wireless network of soil-moisture and temperature sensors placed in the root zone of the plants. In addition, a gateway unit handles sensor information, triggers actuators, and transmits data to a web application. An algorithm was developed with threshold values of temperature and soil moisturethat was programmed into a micro-controller-based gateway to control water quantity. The system waspowered by solar panels and had a duplex communication link based on a cellular-Internet interface that allowed for data inspection and irrigation scheduling to be programmed through a web page.

Introduction:

Aim is to develop a wireless three level controlled smart irrigation system to provide irrigation system which is automatic for the plants which help in saving water and money. The main objective is to applythe system for improvement of health of the soil and hence the plant via multiple sensors. We includedUltrasonic sensor for checking the level of the water content in the water tanks and moisture sensor to maintain the moisture required for the plants growth. We included the GSM module to sent the data wirelessly to the user and make him know the status of the plants in the farm.

Block Diagram:



Methodology:

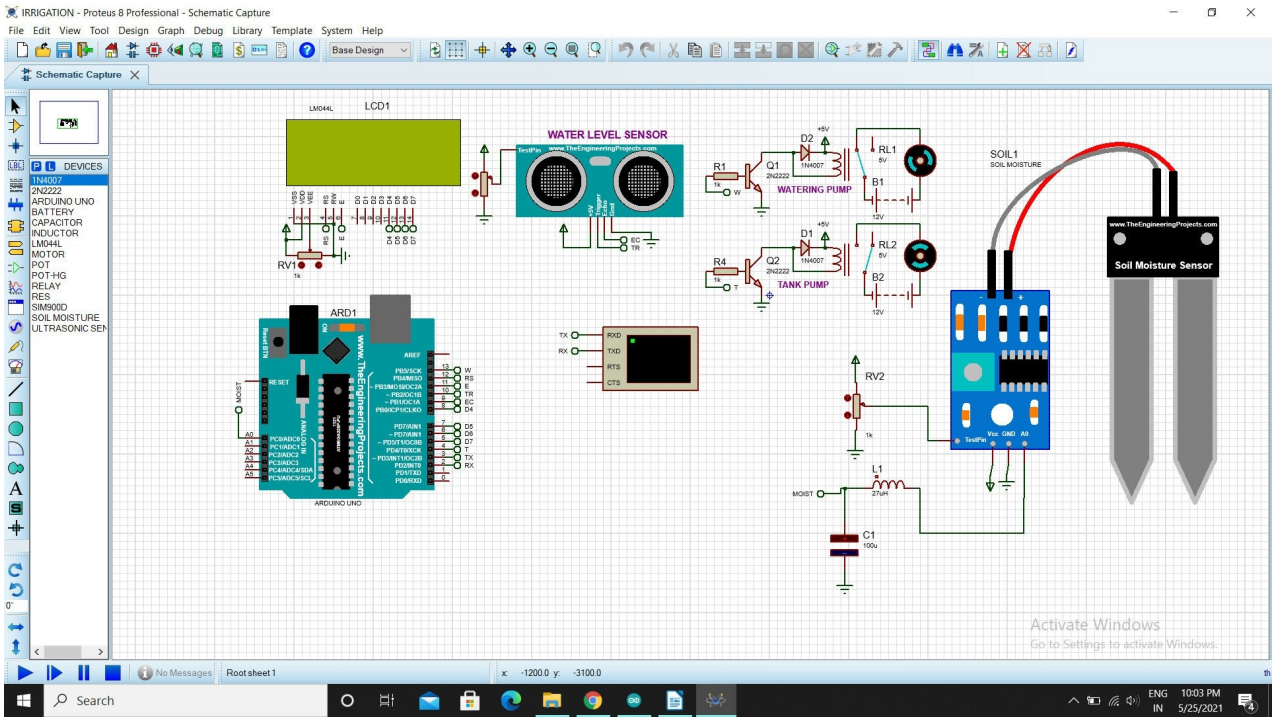
Moisture sensor is used for sensing the moisture content in the soil thereby providing water when required. Ultrasonic sensor is used to check the depth of the water tank thereby if the water content inthe water tank is less than the threshold we have to supply the water.

These are always checked and is updated every one minute and send that information to the user via theGSM module to the user. Where he get the updates of the plants in his farm/garden.

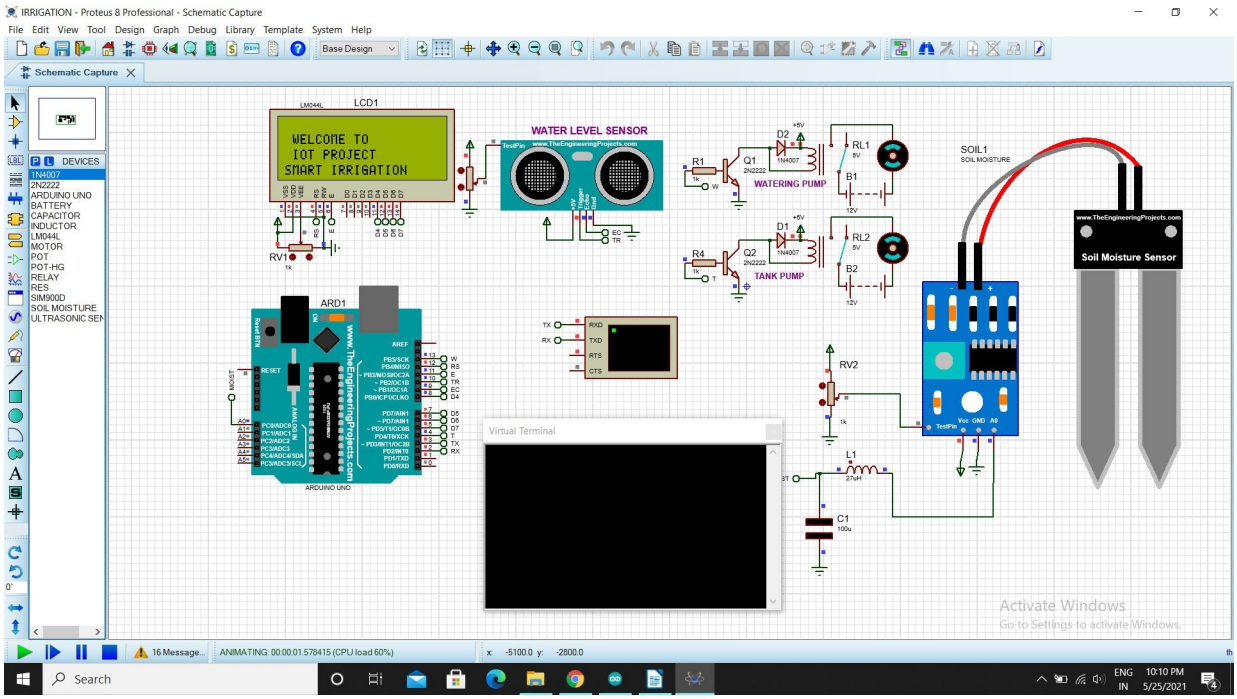
We are using Proteus simulation software to run this project, in that we have placed Arduino UNO, which is the brain of this project it takes the inputs via the analog and digital pins and process that dataand make the motors which we placed for running the water pump and the tank pump are turned on oroff depending on the condition which we want for us or the plants to grow them properly.

We used Arduino IDE which development environment where we placed the code required for theproject and integrate it to the Proteus simulator to run this project virtually.

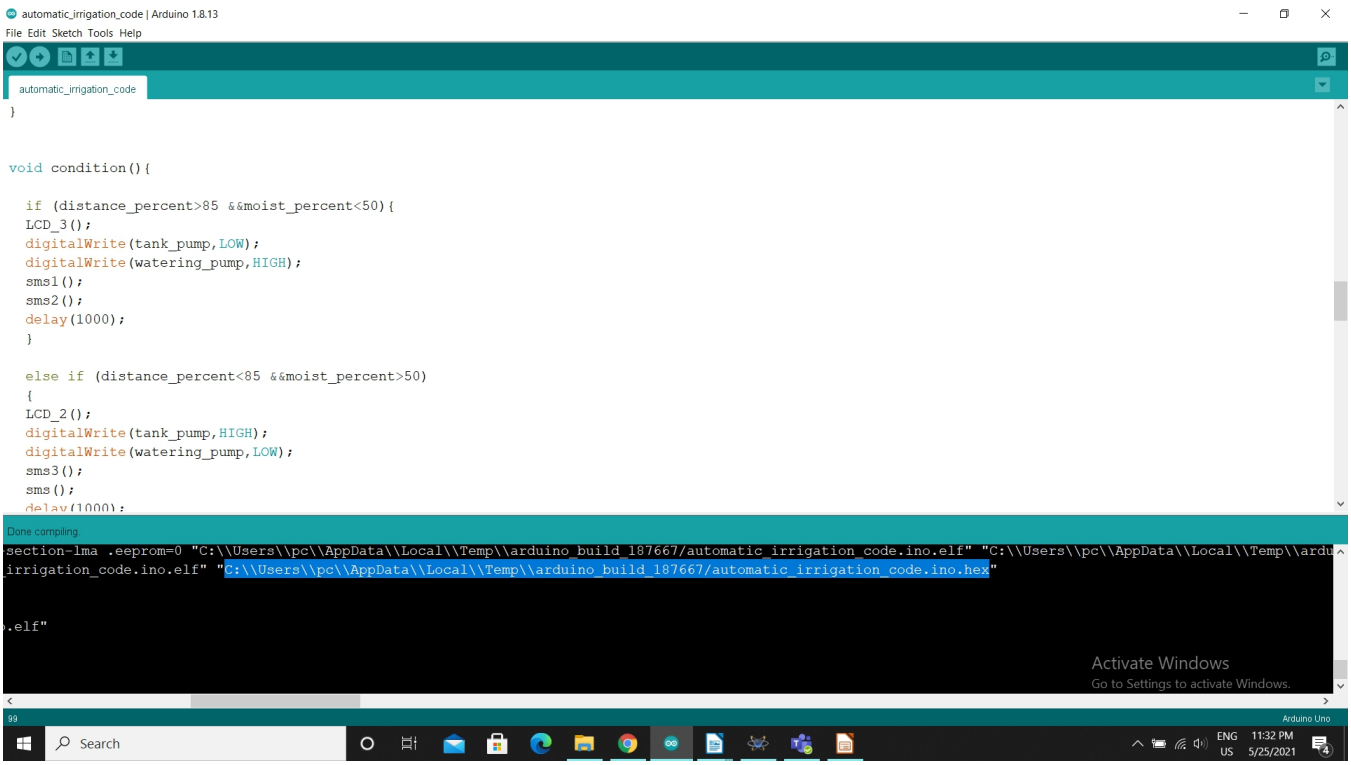
Schematic Diagram:



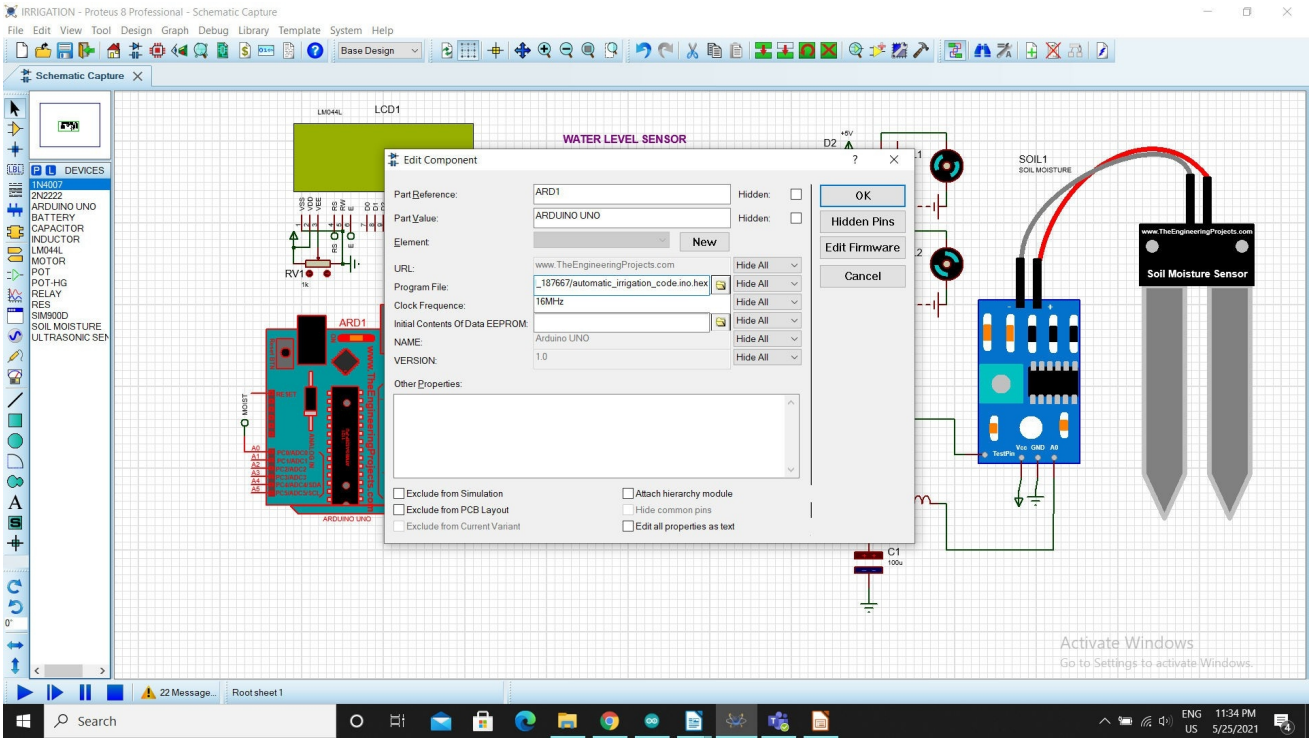
Working of the Project:



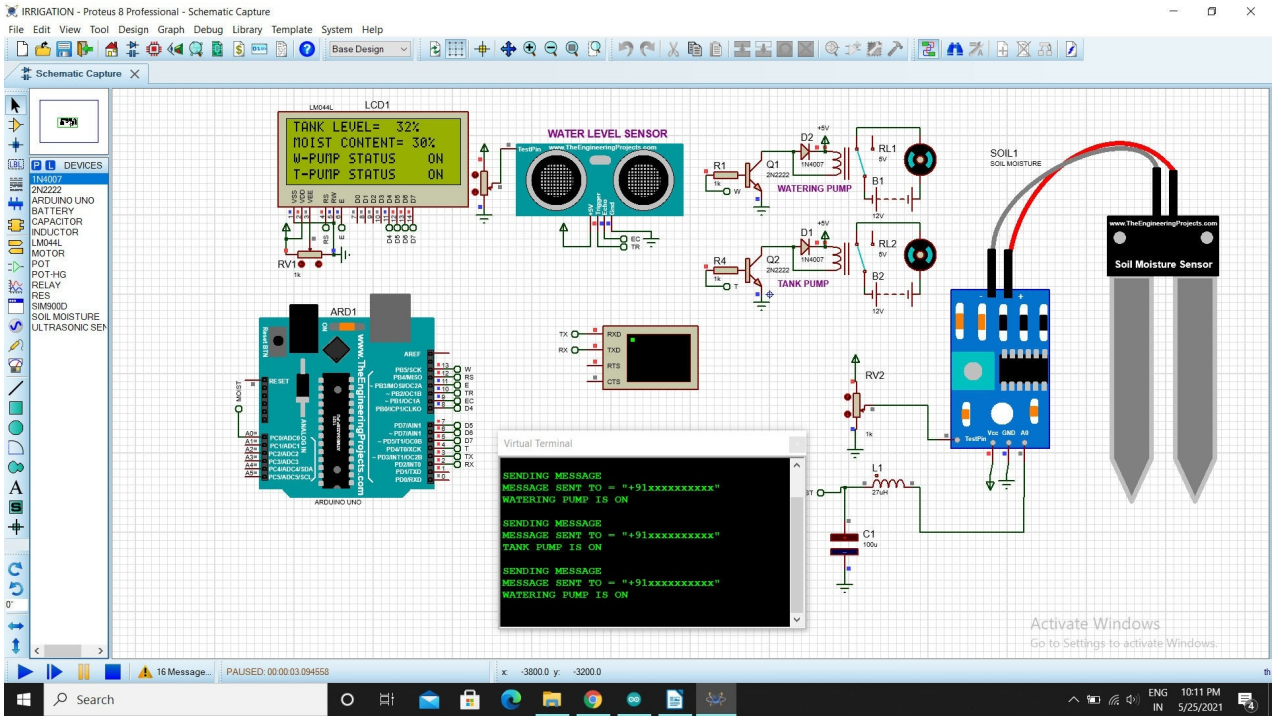
Before starting this Proteus simulation we have to generate the hex file in Arduino IDE and paste thedirectory of the hex file in the Arduino in the Proteus simulator as shown below.



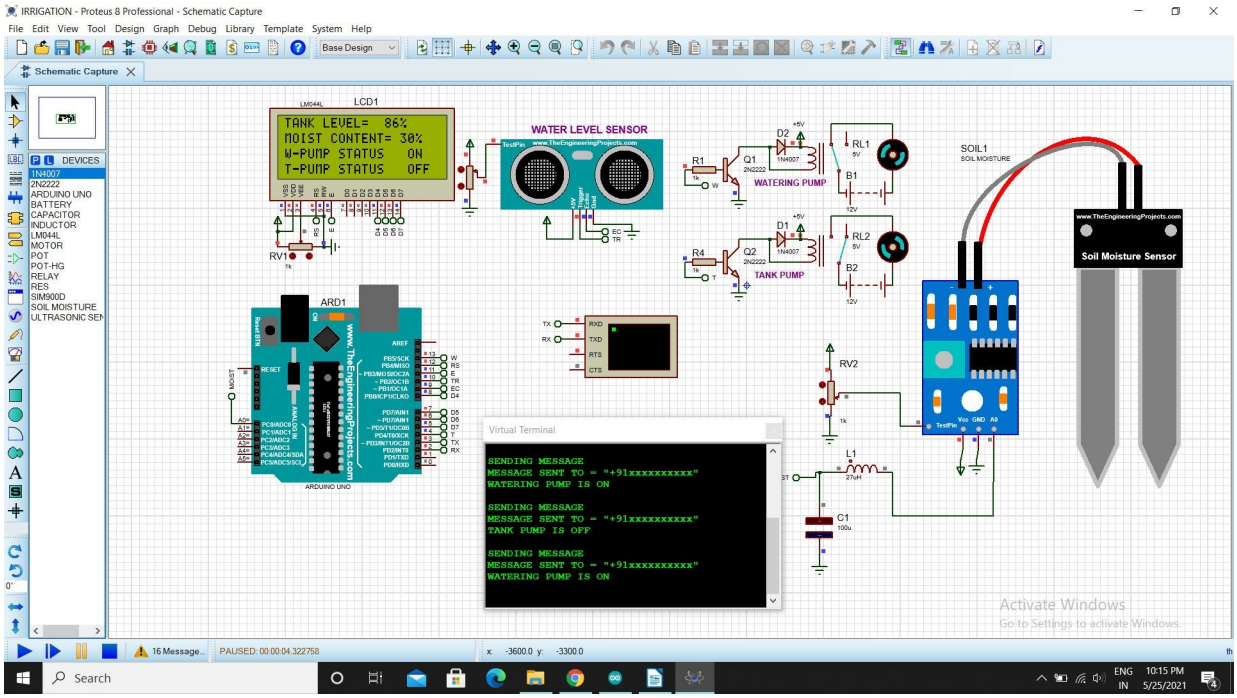
That directory of hex file should be copied and placed in Arduino in Poteus.



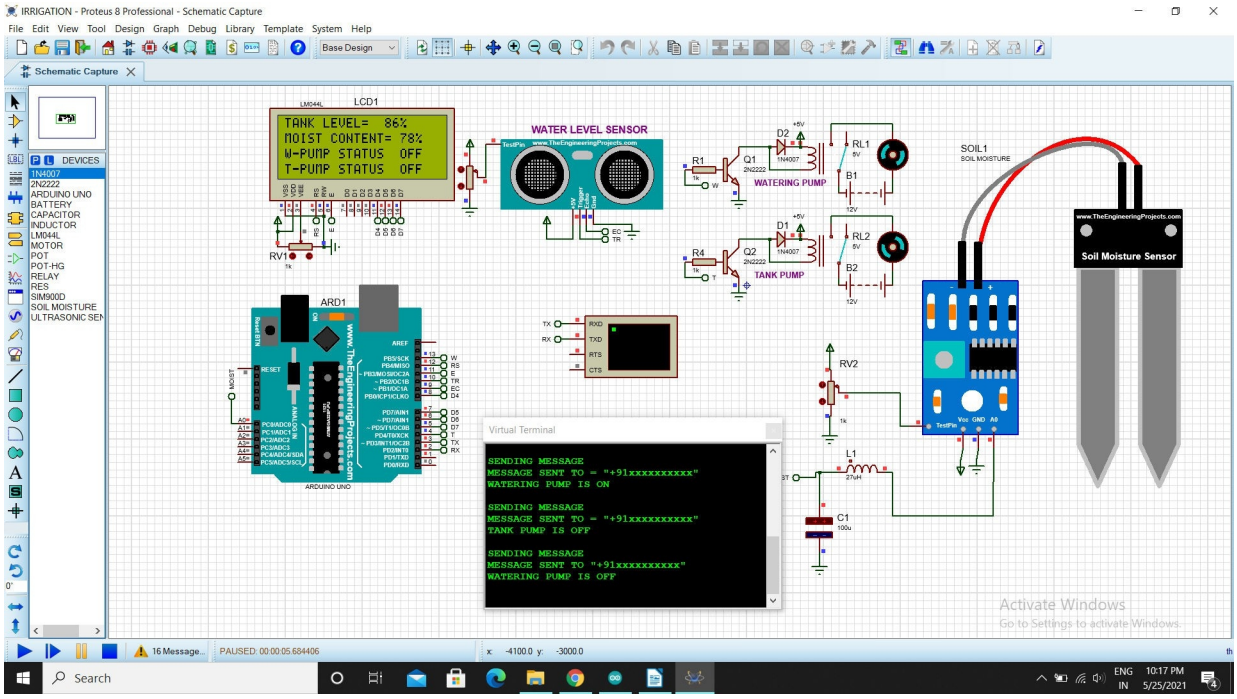
Then click on OK and start the simulation.



Now we can see in the above screenshot the tank level is 32% and moisture level is 30% we have set the threshold of the water level of the tank to be 85% and if it is less than that percentage the tank pumpwill be turned ON. And moisture sensor threshold value is kept as 50% if it is less than that the water pump is turned ON. As the values are less than the threshold both motors are turned ON and that information sent to user through GSM module.

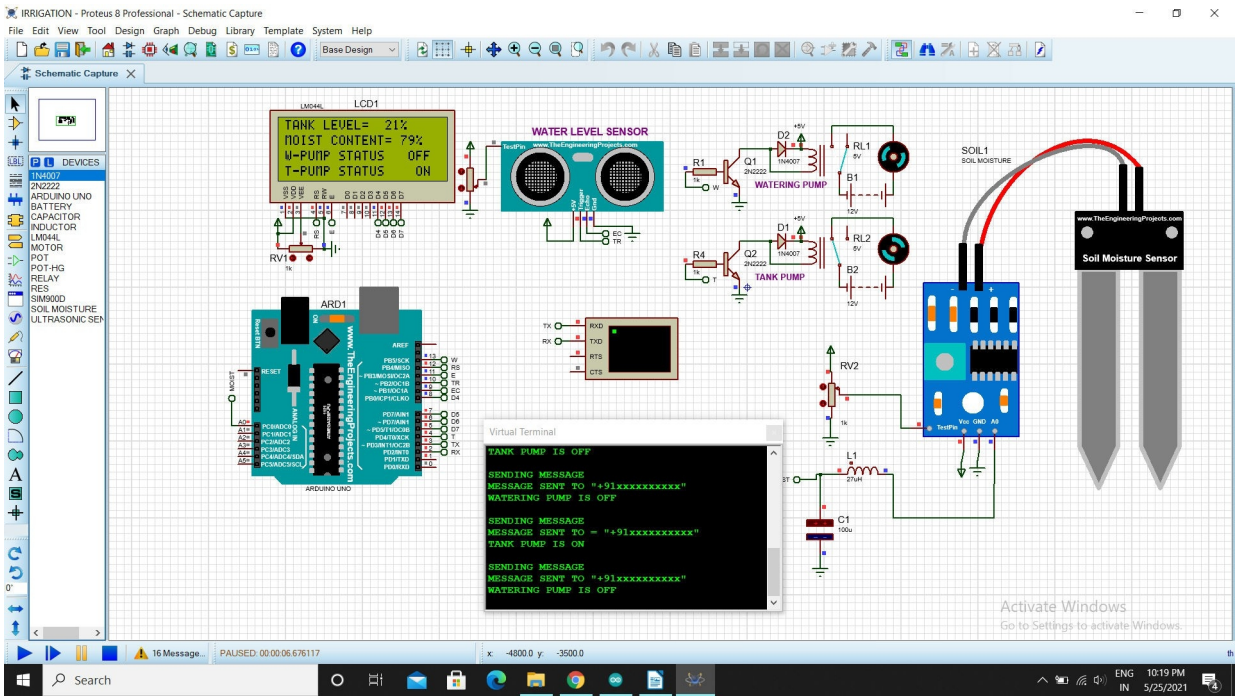


The potentiometer is tweaked to change the values of the sensors. In the above picture tank level is more than 85% so the tank pump is turned OFF whereas the moisture sensor value is less than 50% sothe water pump motor is turned ON.



In the above picture, both the sensor values are more than their threshold values so their respectivemotors are turned OFF.

The GSM code is written in such a way that it send the data to the user continuously every one minutewe can change it to like every ten minutes and run the simulation.



In the above picture we can see that water in the tank is less than the threshold so the tank pump isturned ON whereas the moisture level is more than the threshold it is turned OFF.

Conclusion:

The smart irrigation system is implemented is feasible and cost effective for optimizing water resourcesfor agriculture production. This irrigation system allows cultivation in places with water scarcity therbyimproving sustainability. The smart irrigation system developed proves that the use of water can be diminished for a given amount of fresh biomass production. The use of solar power in this irrigation system is pertinent and significantly important for organic crops and other agricultural products that aregeographically isolated, where the investment in electrical power supply would be expensive. Real timesystem for irrigation is based on GSM and zigbee module. The system is incredibly versatile and economical. It doesn't need individuals on duty it is so easy and reliable.

Program:

```
#include<LiquidCrystal.h>
#include <SoftwareSerial.h>
#define echo 9
#define trigger 10
#define tank_pump 4
#define watering_pump 13
#define moisture_sensor A0
long duration;
int distance;
int moisture_value; int
distance_percent;int
moist_percent;
SoftwareSerial SIM900(2, 3);
LiquidCrystal lcd(12,11,8,7,6,5);
void setup () {
lcd.begin(20,4);
SIM900.begin(9600);
Serial.begin(9600);
pinMode(echo,INPUT);
pinMode(moisture_sensor,INPUT);
pinMode(trigger,OUTPUT);
digitalWrite(trigger,LOW);
pinMode(watering_pump,OUTPUT);
pinMode(tank_pump,OUTPUT);
digitalWrite(watering_pump,LOW);
digitalWrite(tank_pump,LOW);
lcd.setCursor(0,1);
lcd.print(" WELCOME TO "        );
delay(500);
lcd.setCursor(0,2); lcd.print("
IOT PROJECT");
```

```
delay(500);
lcd.setCursor(0,3);
lcd.print("SMART IRRIGATION");
delay(500);
lcd.clear();
}
void loop(){
 // LEVEL SENSOR
 digitalWrite(trigger,LOW); delayMicroseconds(2);
 digitalWrite(trigger,HIGH); delayMicroseconds(10);
 digitalWrite(trigger,LOW);
 duration=pulseIn(echo,HIGH);
 distance=duration*0.017;
 distance_percent=map(distance,0,1023,0,100);
 moisture_value= analogRead(moisture_sensor);
 moist_percent=map(moisture_value,0,1023,0,100);condition();
}
void sms(){
SIM900.print("SENDING MESSAGE \r");
SIM900.println("MESSAGE SENT TO \"+91xxxxxxxxxx\"");// recipient's mobile number
SIM900.println("WATERING PUMP IS OFF"); // message to send
SIM900.println();
}
void sms1(){
SIM900.print("SENDING MESSAGE \r");
SIM900.println("MESSAGE SENT TO = \"+91xxxxxxxxxx\"");// recipient's mobile number
SIM900.println("TANK PUMP IS OFF"); // message to send
Serial.println("TANK PUMP IS OFF");
SIM900.println();
}
```

```
void sms2(){
SIM900.print("SENDING MESSAGE \r");
SIM900.println("MESSAGE SENT TO = \"+91xxxxxxxxxx\"");// recipient's mobile number
SIM900.println("WATERING PUMP IS ON"); // message to send Serial.println("WATERING PUMP
IS ON");
SIM900.println();
}
void sms3(){
SIM900.print("SENDING MESSAGE \r");
SIM900.println("MESSAGE SENT TO = \"+91xxxxxxxxxx\"");// recipient's mobile number
SIM900.println("TANK PUMP IS ON"); // message to send
Serial.println("TANK PUMP IS ON");
SIM900.println();
}
void condition(){
  if (distance_percent>85
  &&moist_percent<50){LCD_3();
  digitalWrite(tank_pump,LOW);
  digitalWrite(watering_pump,HIGH);
  sms1();
  sms2();
  delay(1000);
  }
  else if (distance_percent<85 &&moist_percent>50)
  { LCD_2()
  ;
  digitalWrite(tank_pump,HIGH);
  digitalWrite(watering_pump,LOW);
  sms3();
  sms();
  delay(1000);
  }
```

```
  else if (distance_percent>85 &&moist_percent>50)
  { LCD_4()
  ;
  digitalWrite(tank_pump,LOW);
  digitalWrite(watering_pump,LOW);
  sms1();
  sms();
  delay(1000);
  }
  else if (distance_percent<85 &&moist_percent<50)
  { LCD_1()
  ;
  digitalWrite(tank_pump,HIGH);
  digitalWrite(watering_pump,HIGH);
  sms3();
  sms2();
  delay(1000);
  }
}
void
  LCD_1(){ lcd.clear()
  ; lcd.setCursor(0,0);
  lcd.print("TANK LEVEL=  ");
  lcd.print(distance_percent);
  lcd.print("%"); lcd.setCursor(0,1);
  lcd.print("MOIST CONTENT= ");
  lcd.print(moist_percent);
  lcd.print("%");
  lcd.setCursor(0,2);
  lcd.print("W-PUMP STATUS ");
  lcd.print(" ON");
```

```
lcd.setCursor(0,3);
  lcd.print("T-PUMP STATUS ");
  lcd.print(" ON");
}
void
  LCD_2(){ lcd.clear()
  ; lcd.setCursor(0,0);
  lcd.print("TANK LEVEL=  ");
  lcd.print(distance_percent);
  lcd.print("%"); lcd.setCursor(0,1);
  lcd.print("MOIST CONTENT= ");
  lcd.print(moist_percent);
  lcd.print("%");
  lcd.setCursor(0,2);
  lcd.print("W-PUMP STATUS ");
  lcd.print(" OFF");
  lcd.setCursor(0,3);
  lcd.print("T-PUMP STATUS ");
  lcd.print(" ON");
}
void
  LCD_3(){ lcd.clear()
  ; lcd.setCursor(0,0);
  lcd.print("TANK LEVEL=  ");
  lcd.print(distance_percent);
  lcd.print("%"); lcd.setCursor(0,1);
  lcd.print("MOIST CONTENT= ");
  lcd.print(moist_percent);
  lcd.print("%");
  lcd.setCursor(0,2);
```

```
lcd.print("W-PUMP STATUS ");
  lcd.print(" ON");
  lcd.setCursor(0,3);
  lcd.print("T-PUMP STATUS ");
  lcd.print(" OFF");
}
void
  LCD_4(){ lcd.clear()
  ; lcd.setCursor(0,0);
  lcd.print("TANK LEVEL=  ");
  lcd.print(distance_percent);
  lcd.print("%"); lcd.setCursor(0,1);
  lcd.print("MOIST CONTENT= ");
  lcd.print(moist_percent);
  lcd.print("%");
  lcd.setCursor(0,2);
  lcd.print("W-PUMP STATUS");
  lcd.print(" OFF");
  lcd.setCursor(0,3);
  lcd.print("T-PUMP STATUS");
  lcd.print(" OFF");
}
```