Bahria University,

Karachi Campus

COURSE: Embedded System Design Lab
TERM: FALL 2023, CLASS: BSE- 5(A)

Engr. Dr.Qamaruddin Memon/ Engr. Ismail Mansoor

Signed **Remarks:** **Score:**

GROUP MEMBERS LIST:

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Introduction and Problem Statement:

Introduction:

In modern agriculture, the integration of technology has become pivotal in enhancing productivity, resource efficiency, and sustainability. One such innovative solution is the development of automatic irrigation systems using embedded systems. These systems leverage advanced sensors, microcontrollers, and communication technologies to create an intelligent and automated approach to watering crops. The implementation of automatic irrigation systems offers numerous benefits, including optimized water usage, improved crop yields, and reduced manual labour. This integration aligns with the evolving needs of the agriculture sector, where precision and efficiency are paramount.

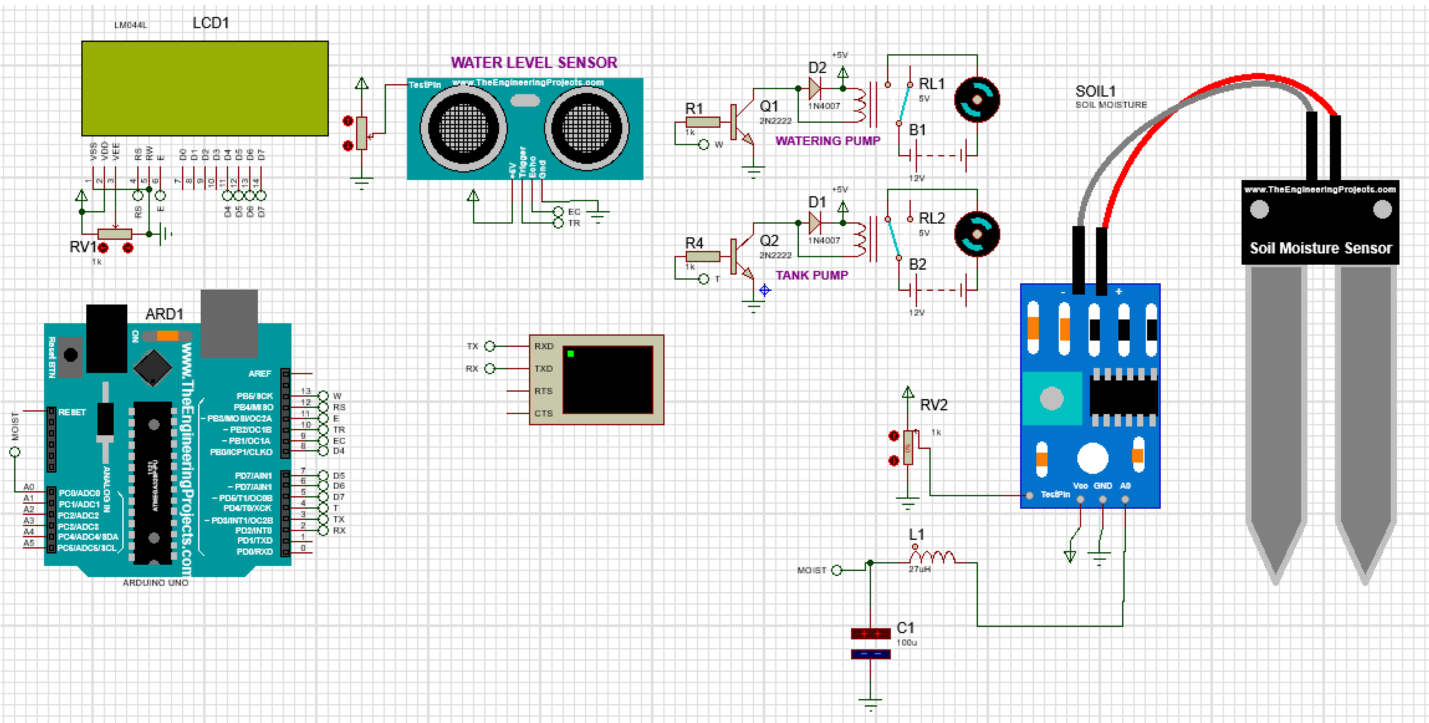
Problem Statement:

Despite the promising advantages of automatic irrigation embedded systems, several challenges need to be addressed for widespread adoption and optimal functionality. One primary concern is the need for a robust and reliable system that accurately senses soil moisture levels, weather conditions, and crop requirements. Ensuring precise data acquisition and analysis is crucial to avoid over-irrigation or under-irrigation, both of which can negatively impact crop health and water resource management. Additionally, the scalability, cost-effectiveness, and energy efficiency of these systems pose significant challenges that require innovative solutions. This research aims to tackle these issues and contribute to the development of highly efficient and intelligent automatic irrigation embedded systems that can revolutionize modern agriculture practices.

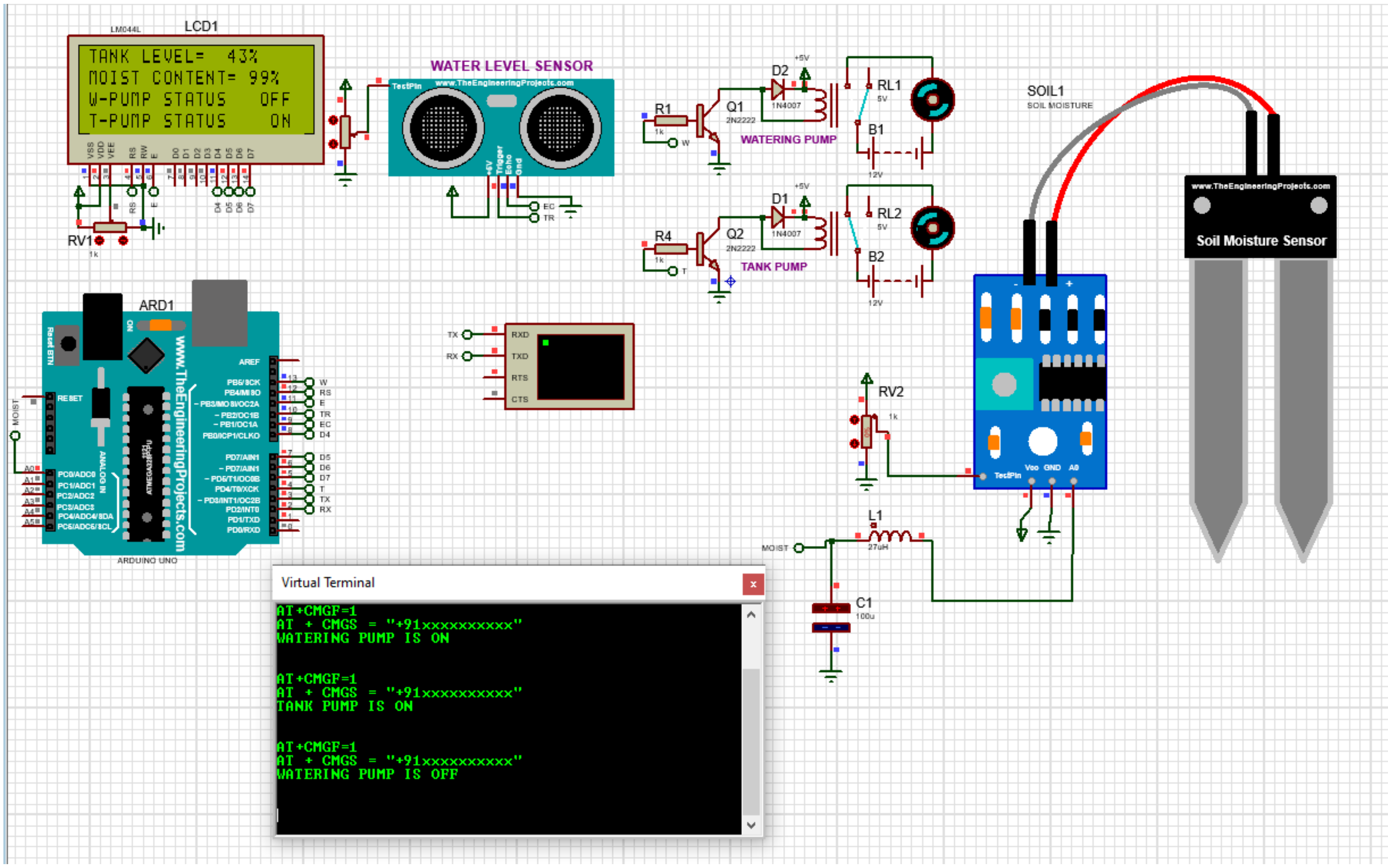
Components:

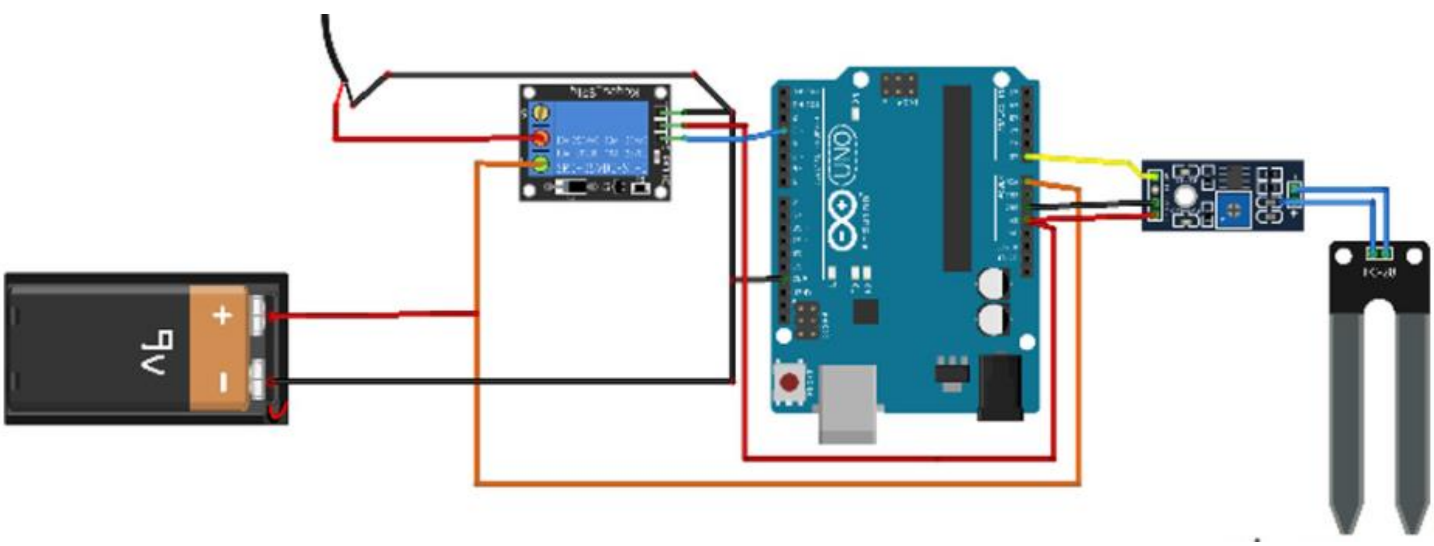
- Arduino Uno
- Soil Moisture Sensor
- 5v Relay
- Water Pump with DC motor
- Connecting wires

Circuit Diagram:



Simulation:


LCD1
TANK LEVEL= 43%
MOIST CONTENT= 99%
W-PUMP STATUS OFF
T-PUMP STATUS ON
WATER LEVEL SENSOR
RV1
ARD1
ARDUINO UNO
www.TheEngineeringProjects.com
R1
Q1
D2
RL1
B1
WATERING PUMP
R4
Q2
D1
RL2
B2
TANK PUMP
SOIL1
SOIL MOISTURE
Soil Moisture Sensor
RV2
L1
C1
MOIST
RXD
TXD
RTS
CTS
Virtual Terminal
AT+CMGF=1
AT + CMGS = "+91xxxxxxxxxx"
WATERING PUMP IS ON
AT+CMGF=1
AT + CMGS = "+91xxxxxxxxxx"
TANK PUMP IS ON
AT+CMGF=1
AT + CMGS = "+91xxxxxxxxxx"
WATERING PUMP IS OFF


9v
+
-
UNO

Code:

```
int soilMoistureValue = 0;

int percentage=0;

void setup() {

  pinMode(3,OUTPUT);

  Serial.begin(9600);

}

void loop() {

soilMoistureValue = analogRead(A0);

Serial.println(percentage);

percentage = map(soilMoistureValue, 490, 1023, 100, 0);

if(percentage < 10)

{

  Serial.println(" pump on");

  digitalWrite(3,LOW);

}

if(percentage >80)

{

  Serial.println("pump off");
```

```
  digitalWrite(3,HIGH);

}

}
```

Specification:

Soil Moisture sensor specification:

Specifications

Board Size	3.2 cm x 1.4 cm
Working voltage	5V DC
Working current	<20 mA
Interface type	Analog
Working Temperature	10°C~30°C

Working Steps:

1. Connect the Relay to Arduino:
    - Connect the VCC of the relay module to the 5V pin on the Arduino.
    - Connect the ground of the relay module to the ground (GND) pin on the Arduino.
    - Connect the relay signal pin to any digital pin on the Arduino, excluding pin 13. In this case, it's connected to pin 3.
2. Connect the Pump to the Relay Module:

- The relay module has three connection points: common, normally closed, and normally open.
- Connect the pump's positive wire to the common pin of the relay module.
- Connect the normally open pin of the relay module to the positive terminal of the battery (select a suitable battery based on your pump).
- Connect the ground of the pump to the ground (GND) pin on the Arduino.

3. Connect the Soil Moisture Sensor to Arduino:
    - Connect the VCC of the soil moisture sensor to the 5V pin on the Arduino.
    - Connect the ground (GND) of the soil moisture sensor to the ground pin on the Arduino.
    - Connect the analogue output of the sensor to any analogue pin on the Arduino. In this case, it's connected to pin A0.
4. Connect the Pump Hose:
    - Connect the small hose to the water pump.

Conclusion:

In conclusion, the development and integration of automatic irrigation embedded systems present a significant leap forward in modern agriculture. The utilization of advanced technologies such as microcontrollers, sensors, and communication systems has the potential to revolutionize traditional irrigation practices. This research has explored the promising benefits of these systems, including enhanced resource efficiency, optimized crop yields, and reduced manual labor.

In conclusion, the future of agriculture lies in the seamless integration of technology, and automatic irrigation embedded systems stand at the forefront of this transformative journey. By addressing the identified challenges and leveraging technological advancements, we can pave the way for a more sustainable, efficient, and productive agricultural sector.

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Bahria University, Karachi Campus
Department of Software Engineering
Rubrics for the Assessment of Lab Projects

Rubrics for the Assessment of Lab Projects

Semester: Fall 2023

Student Name: Lab Engineer : <u>M ISMAIL MANSOOR</u>

Enrollment No: Course Name: <u>EMBEDDED SYSTEM DESIGN LAB</u>

Project Rubrics

	Criteria	Exemplary (5-4)	Satisfactory (3-2)	Unsatisfactory (1-0)	Total
		Exemplary (10-7)	**Satisfactory (6-3)**	**Unsatisfactory (2-0)**	
Project Management (A3) (10 Marks)	**Project Proposal**	☐Well-defined project proposal which meets all the software engineering criteria (project plan, roles, and responsibilities etc.).	☐Adequate project proposal which meets all the software engineering criteria (project plan, roles, and responsibilities etc.).	☐Incomplete project proposal	
	Project Report	☐Well-defined project report which covers all phases of software engineering	☐Adequate project report which covers all phases of software engineering	☐Incomplete project report	
Project Demonstration (P4) (15 Marks)	**Project Design (Marks 10/5)**	☐Complete project design is demonstrated	☐Few project design modules are demonstrated	☐Incomplete project design.	
	Project Implementation (Marks 5/10)	☐Student constructs all functions as presented in proposal	☐Student constructs some functions as presented in proposal	☐Incomplete implementation	
Viva (A2) (5 Marks)	**Responsiveness to questions**	☐Student responds well, quick, and accurately all the time	☐Student responds well, quick, and accurately most of the time	☐No response to questions at all	

Marks Obtained=__________/30

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