101903545

A Practical Activity Report Submitted

For Engineering Design Project – II

(UTA-014)

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Submitted to

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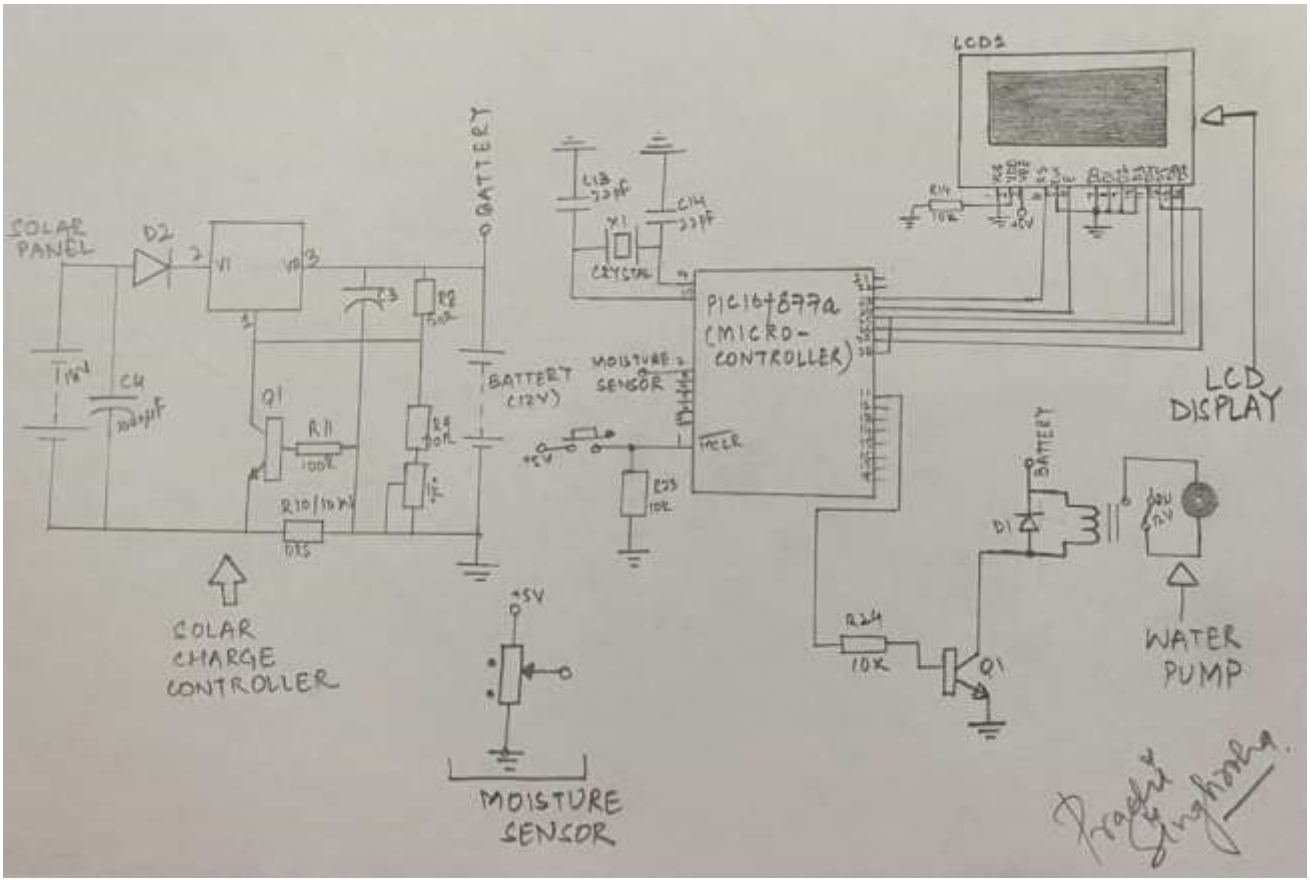
Objective: Design a microcontroller-based detection system for a Soil Humidity sensor with a neat circuit diagram.

Circuit Diagram:



Working of the circuit:

On the left side of the circuit diagram, there is a solar charge controller which is connected to an 18V solar panel of 3 Watt charging a 12V battery r 6Amp which in turn acts as a 5V voltage regulator because a constant voltage of 5V is required at various parts of the main circuit. At the bottom left of the circuit diagram is we can see the moisture sensor which works on the principle of changing voltage and gives output in form of voltage. The sensor is connected to the analog pin of the microcontroller.

In the middle of the circuit diagram, we can see the microcontroller, here PIC16f877a. The $\overline{MCLR}$ pin of the microcontroller is like a reset pin and is active when it is zero. If it will be active then the microcontroller will reset which is something we don't want. Hence, we provide it a HIGH logic so that it is always ON which is achieved by using an oscillator circuit (providing the frequency of 8MHz) which is placed just left to it in the circuit diagram.

Port B of the microcontroller is connected to the LCD which is placed at the top right corner in the circuit diagram. LCD displays the value of moisture and the status of the moisture pump. At the bottom right of the circuit diagram, we can see a water pump that is connected through a relay.

When the code is run the value of moisture and status of the water pump is displayed on the LCD screen. If the value of moisture is a certain percentage or above then the status is wet else dry. If the LCD displays wet then the microcontroller will turn off the relay which in turn will turn the water pup off. The water pump is then turned on when the moisture in the soil gets to a certain percentage or less.

Selection of Sensor:

Sensor	*Price*	*Available at*
REES52 TW215	₹82	Amazon.com
Spark Fun Moisture Sensor	₹547	Amazon.com
Robu moisture sensor kit	₹103	Amazon.com
DHT11	₹119	https://www.electronicscomp.com/
EC-1258(Soil Moisture Sensor module)	₹58	https://www.electronicscomp.com/

Features of EC-1258(Soil Moisture Sensor Module):

1. Dual output mode
2. Cheap
3. Operating voltage: 3.3V~5V
4. Have LM393 comparator chip, stable

5. With power indicator (red) and digital switching output indicator (green)

Applications of EC-1258(Soil Moisture Sensor Module):

1. The soil moisture module is most sensitive to the ambient, generally used to detect the moisture content of the soil.

2. When the module cannot reach the threshold value, DO port output high, when the soil humidity exceeds a set threshold value, the module D0 output low.

3. The small board digital output D0 can be connected directly to the MCU, MCU to detect high and low, to detect soil moisture.

4. Small board analog output AO and AD module connected through the AD converter; one can get more precise values of soil moisture.

Selection of Microcontroller:

Microcontroller	*Price*	*Selection Criterion*
PIC16f877a	₹127	Uses flash memory technology
ATMEGA8A-AU AVR	₹100	Runs upto 20MHz
ARM Cortex M-3	₹400	High speed and allowing the use of complex algorithms
8051	₹513	Simplified architecture and instruction set

Features of PIC16f877a:

1. Low power consumption.
2. Small hardware stack.
3. Advanced interface.
4. A small set of instructions.
5. Sleep mode available which can be very helpful in this particular project.
6. Uses microcontroller architecture i.e., no OS required.

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Applications of PIC16f877a:

1. Remote sensors
2. Home automation
3. Security and safety devices
4. Advanced medical devices
5. Audio accessories

Tentative cost of the project:

Component	*Price*	*Available at*
Solar charge controller + Solar panel + Battery	₹3000	Amazon.com
Moisture Sensor	₹58	https://www.electronicscomp.com/
Water pump	₹140	Amazon.com
Resistor kit	₹89	Flipkart.com
2 Capacitors	₹60	Indianmart.com
Diode	₹15.28	Indianmart.com
LCD Display (16X2)	₹119	Amazon.com
Relay	₹200	Amazon.com
PIC16f877a	₹127	Indianmart.com
6 MHz crystal oscillator	₹8.5	Roboelements.com
Connecting wires	₹100	Indianmart.com

Total: ₹3,916.78