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Annexure I

1. Project Title: Smart Irrigation System

TABLE OF CONTENTS

1.1	Abstract	2-2
1.2	Motivation	2-2
1.3	Objective	2-2
2.1	Block Diagram and Working	3-3
2.2	Technical specifications	4-9
2.3	Results and Analysis	10-10
3.0	Conclusion	11-11

1. Abstract & Objective

1.1 Abstract

Water is very precious to all the humans and as well as to the plants, trees. By using simple irrigation system the water will be supplied at constant level by using moisture sensors information. By using this system land will be irrigated effectively and efficiently. This is very important because this can only ensure the survival of the plants. On the other hand, if there is insufficient water, then also there are chances that the plants may die due to lack of water. So, it is very important for the farmer to maintain the content on the field. In the field of agriculture, use of proper method of irrigation is important and is well known that irrigation by simple irrigation system is very economical and efficient. In the simple irrigation system, the farmer has to keep watch on irrigation time table, which is different for different crops. The project makes the irrigation automated. With the use of low cost sensors and simple circuitry makes the project a low cost product, which can be bought even by a poor farmer. This project is best suited for places where water is scarce and has to be used in limited quantity. Irrigation system controls pump by using automated controller to turn ON & OFF. This allows the farmer to apply the right amount of water at right time, regardless of the availability of the labor to turn motor ON & OFF.

1.2 Motivation

Irrigation is the most important cultural practice and most labor intensive task in daily agriculture sector. Knowing when and how much water is to supply is a very important aspect of irrigation. To do this automatically, sensors and methods are available to determine when plants may need water. Automation involves mechanism of all the industrial activities so as to improve the speed of production, reduction of cost, effective use of resources. Automation is the use of control systems such as computers, cell phones microcontrollers. The main objective of this project is to develop a microcontroller based system to irrigate the plant automatically. This system also supports water management decision, which determines the controlling time for the process. Another objective of the project is to send a short message service (SMS) to farmer regarding irrigation of the field and climatic conditions present at the field.

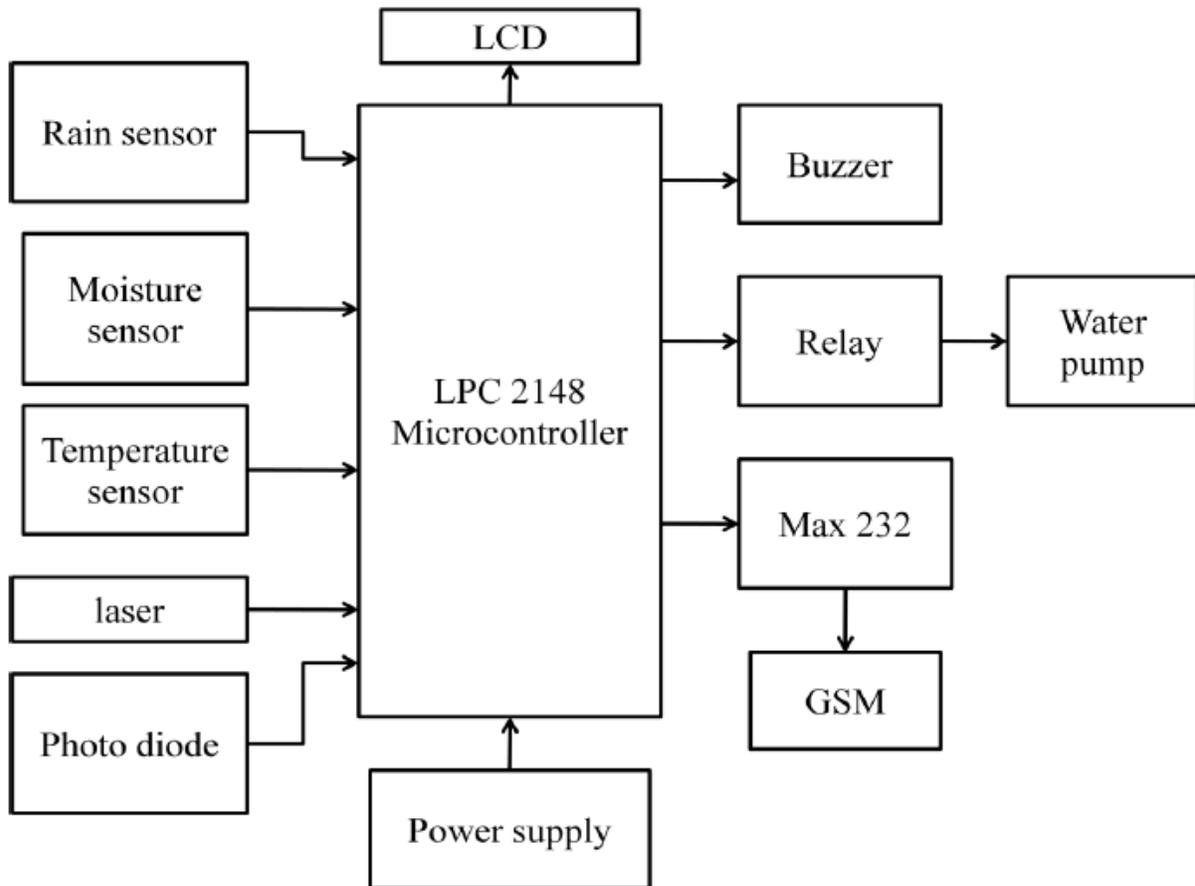
1.3 Objective

The purpose of this project is to reduce the manual monitoring of the field. A method is used to control the level of water supply to the crops which aims at high efficiency of water using moisture sensor. The system utilizes temperature sensor, rain sensor, and GSM module to irrigate the land effectively. It is the proposed solution for the present energy crisis for the Indian farmers.

2. Block Diagram & Technical Specifications

2.1 Block Diagram and Working:

2.1.1. Block Diagram:



2.1.2. Working:

The above is the block diagram for the SMART irrigation system. From the figure the sensor part is given as the input to the microcontroller. Here in our project the sensor part gives the information regarding to the field condition and the LPC2148 microcontroller drives the total operation. Laser and photodiode are also gives as inputs to protect the field. Whenever, any living being enters the field the laser and photo diode finds the obstacle and it sends signal to the microcontroller. Here the microcontroller receives the signals and immediately the buzzer gets ON. When the moisture level is low the microcontroller will sends signals to the relay which performs the switching action i.e., on and off and also reduces the load and gives to the sub dispensed motor which gives water to the water pump and from there it goes to the irrigation lines. In this way the microcontroller operates the field and it is the heart of the project. Here the LCD is used to display the readings and operations done in the field.

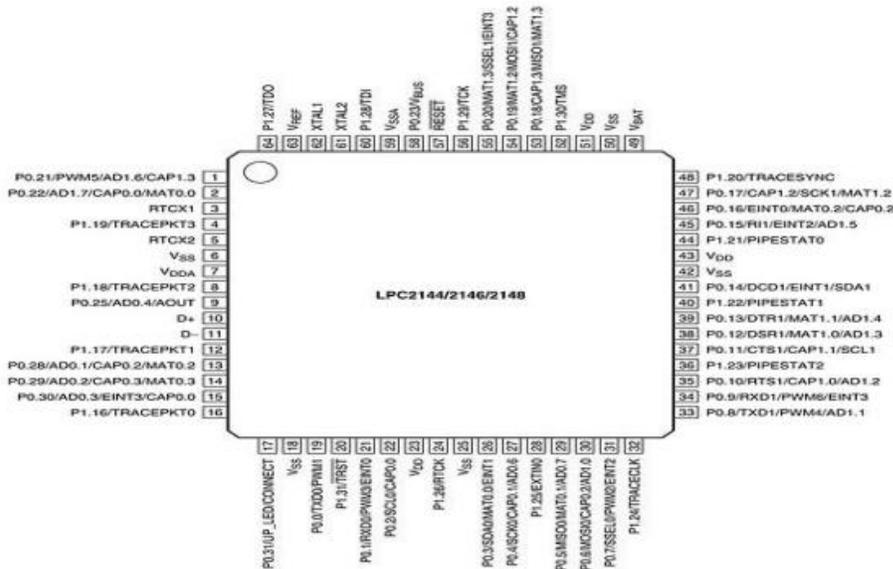
2.2 Technical Specifications:

2.2.1. MICROCONTROLLER (ARM7 based LPC2148):

LPC2148 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support that combine microcontrollers with embedded high-speed flash memory ranging from 32 KB to 512 KB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty.

It has the following features:

- 8 to 40 kB of on-chip static RAM. 32 to 512 kB of on-chip flash program memory.
- 128 bit wide interface/accelerator enables high speed 60 MHz operation.
- In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software
- Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1ms
- Total 64 I/O pins



2.2.2. SENSORS:

➤ Moisture sensor: FC 28

- Features:
 - ✓ Operational temperature: -40 to 85°C
 - ✓ Operating voltage : 3.3V to 5V DC
 - ✓ Power consumption: <7mA

➤ **Temperature sensor: LM35**

Features:

- ✓ Operates from 4 to 20V
- ✓ Range: -55°C to +150°C

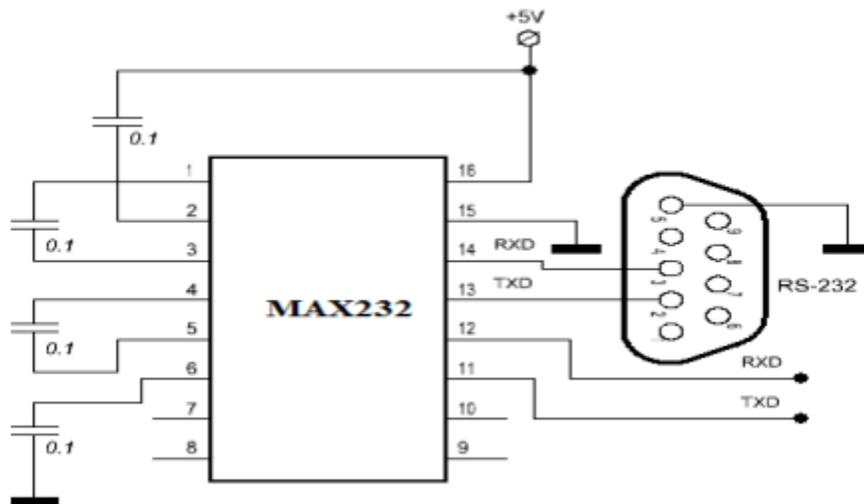
➤ **Rain sensor: YL 83**

• Features:

- ✓ Operating temperature: -20°F to 120°F
- ✓ Receiver power: 22-28 V ac/V dc, 100mA

2.2.3. Serial Communication

RS232 (Recommended standard-232) is a standard interface approved by the Electronic Industries Association (EIA) for connecting serial devices. RS232 is a serial communications standard which enables data to be transferred in serial 'bit stream' from one point to another. Standard RS232 is suitable for data transfer to about 50m, although special low-loss cables can be used for extended distance operation. Four parameters specify an RS232 link between two devices.

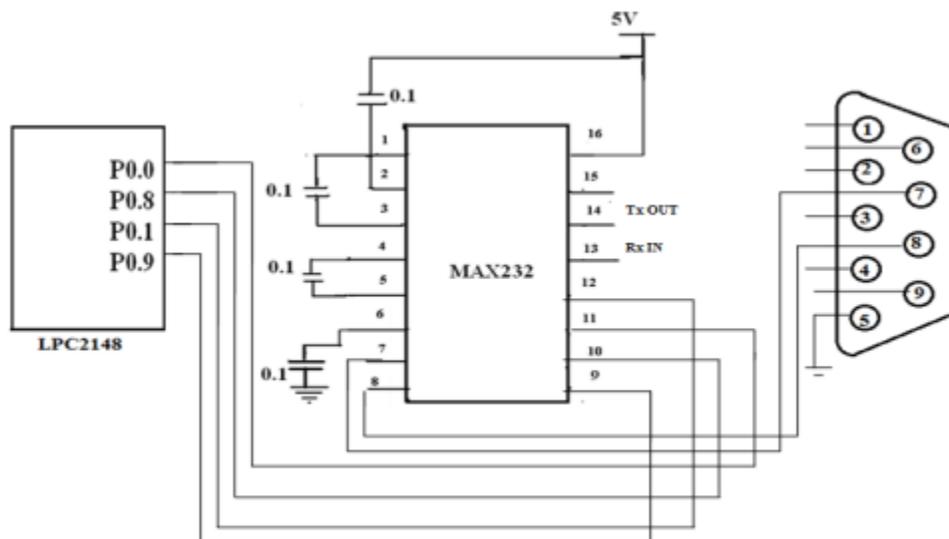


2.2.4. Global System for Mobile Communication

- GSM is a digital mobile telephony system. GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.
- Because radio spectrum is a limited resource shared by all users, a method must be devised to divide up the bandwidth among as many users as possible. Chose a combination of TDMA/FDMA as its method. The FDMA part involves the division by frequency of the total 25 MHz bandwidth into 124 carrier frequencies of 200 kHz bandwidth. One or more carrier frequencies are then assigned to each BS. Each of these carrier frequencies is then divided in time, using a TDMA scheme, into eight time slots.

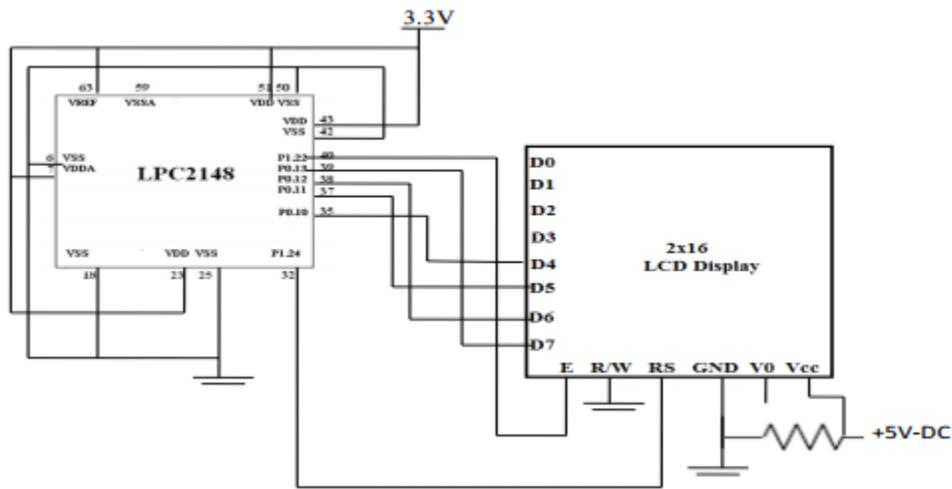
SIM900 General Specification:

Dual-Band 900/ 1800 MHz GPRS multi-slot class 10/8 GPRS mobile station class B Control via AT commands (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands) SIM application toolkit Supply voltage range: 3.2 ... 4.8V Low power consumption: 1.0mA(sleep mode) Operation temperature: -40°C to +85 °C.



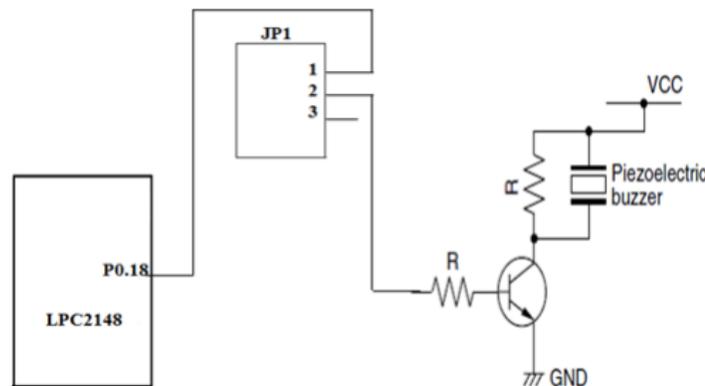
2.2.5. Liquid Crystal Display

LCD is a type of display used in digital watches and many portable computers. LCD displays utilize two sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them. LCD technology has advanced very rapidly since its initial inception over a decade ago for use in laptop computers. Technical achievement has resulted in brighter displays, higher resolutions, reduced response times and cheaper manufacturing processes.



2.2.6. Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.



2.2.7. Water Pumping System

A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps.

Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform mechanical work by moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or wind power, come in many sizes, from microscopic for use in medical applications to large industrial pumps.

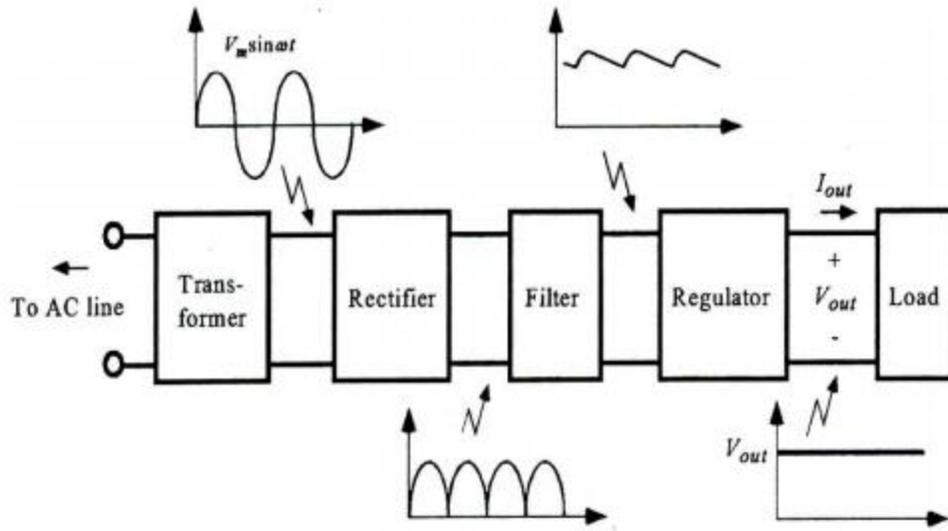
2.2.8 Relay

It's an electrical device that functions something like a wired remote control switch. Instead of having the switch you push/flip/whatever do the work of supplying power to whatever you wanted it to, you have it control a relay which then does the real on/off switching work.

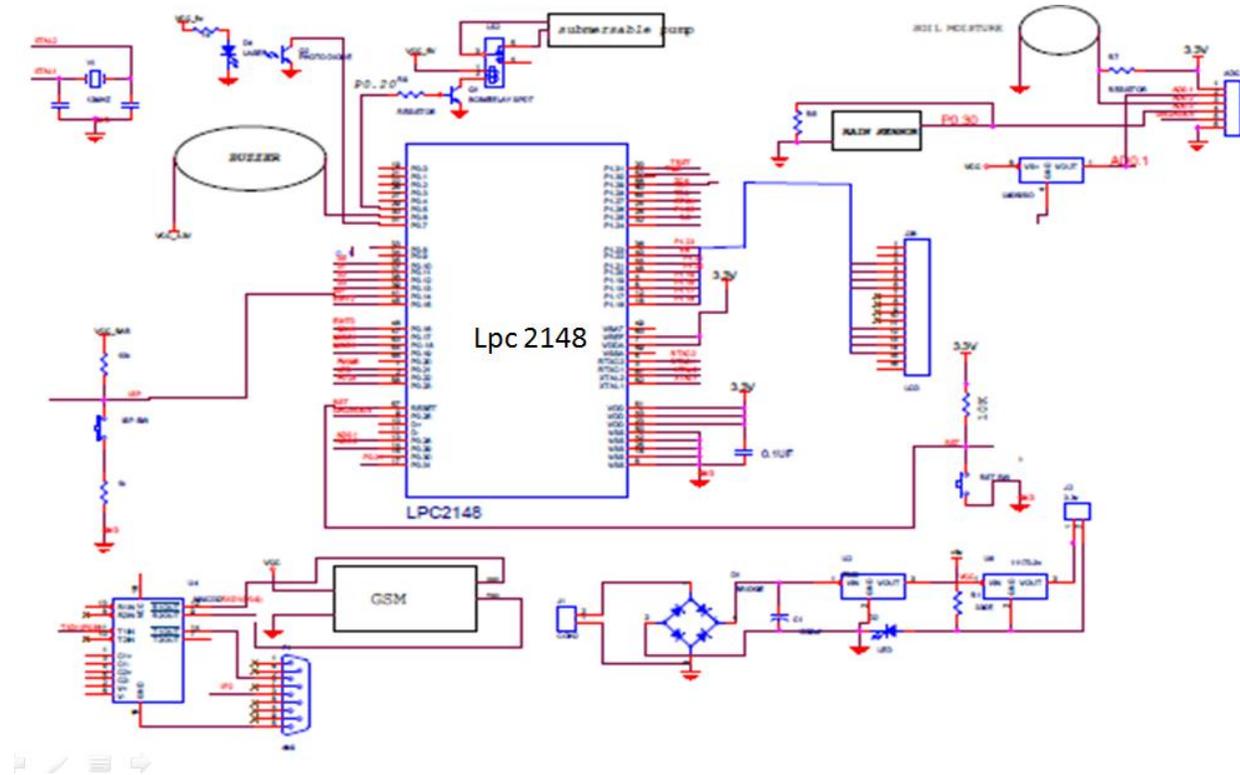
A mechanical relay does this through the use of an electromagnet - a magnet that is only "on" when there's power running through it - that pulls a set of spring loaded contacts to make or break the connection and achieve the on-off effect. This is called the "coil" or trigger wire - the other wire coming out of the coil is connected to ground. Whenever you apply power to the other coil wire (the trigger), the relay is on. As soon as power to this trigger is turned off, the relay turns off. There are also "solid state" relays that achieve the same effect through transistors. Either one functions the same way, the solid state stuff just has no moving parts to wear out, but they tend to be more expensive and not as readily available since the regular mechanical ones are inexpensively and readily available as very high quality, durable units.

2.2.9. Regulated Power Supply

The power supply is designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can be broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as —Regulated D.C Power Supply|. For example a 5V regulated power supply system as shown below:

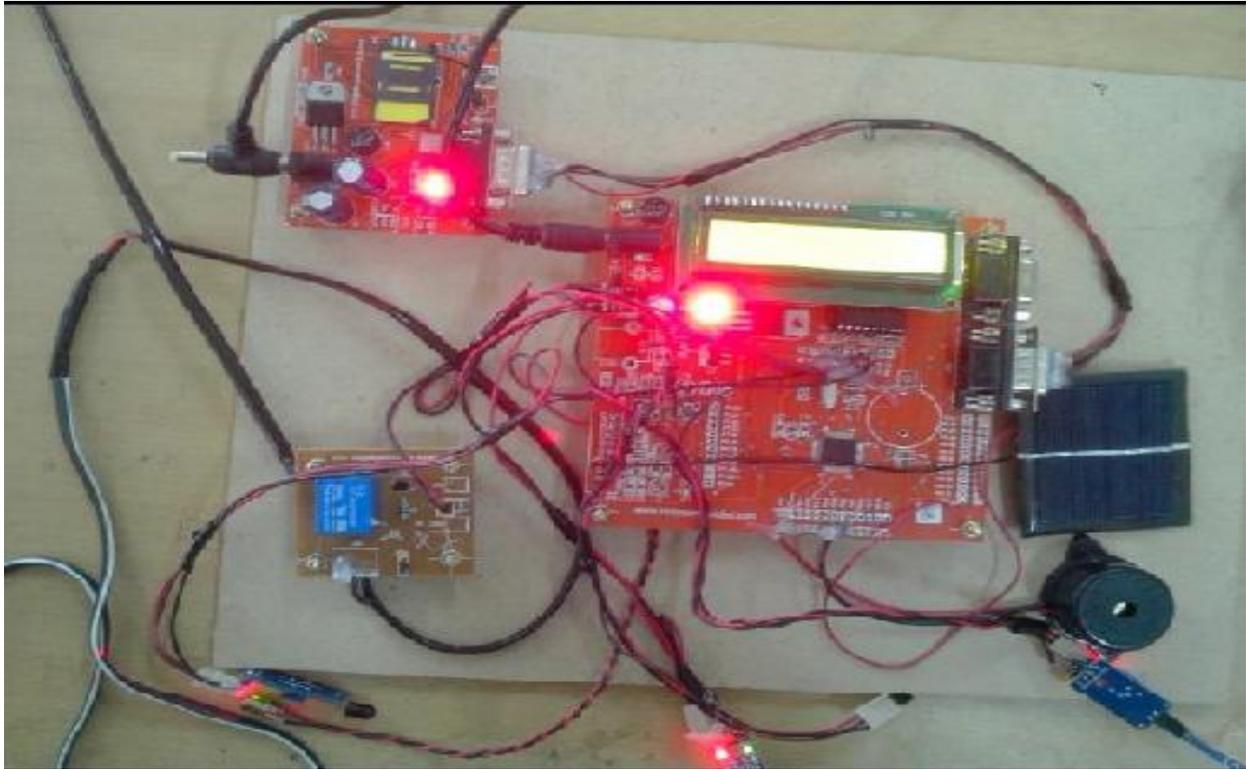


2.2.10. Overall Schematic:



2.3. Results & Analysis

Below diagram shows the circuit (hardware) setup of Smart Irrigation System. Programming is done using embedded c.



Following diagrams shows various display mechanisms initial state of the system , soil moisture , temperature sensor , rain sensor.



3. Conclusion

3.0. Conclusion

The SMART irrigation system proves to be a real time feedback control system which monitors and controls all the activities of irrigation system efficiently. The present system is a model to modernize the agriculture industries at a mass scale with optimum expenditure. They can provide irrigation to larger areas of plants with less water consumption and lower pressure. Using this system, one can save manpower, water to improve production and ultimately profit. This reduces runoff over watering saturated soils avoid irrigating at the wrong time of the day. It improves crop performances and help in time saving.