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Automatic Plant Watering System

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Block Diagram & Working

At another port we connect Darlington amplifier needed for operation of relays. Relays operate at a level of 12 volt and microcontroller sends and receive signals at 5 volts. So to amplify that 5 volt to 12 volt we use Darlington amplifier. It converts 5 volt signal received from microcontroller to 12 volt for operation of relays. At last port we add moisture sensors placed in the fields. These moisture sensors keep records of real time moisture in the fields/planter. And microcontroller compares that value send by sensors to the set value in the microcontroller. If the prescribed value becomes more than the real time moisture in the plant then microcontroller sends signal to relay circuit via Darlington amplifier and corresponding relay sends signal to solenoids to open the valve for water and motor.

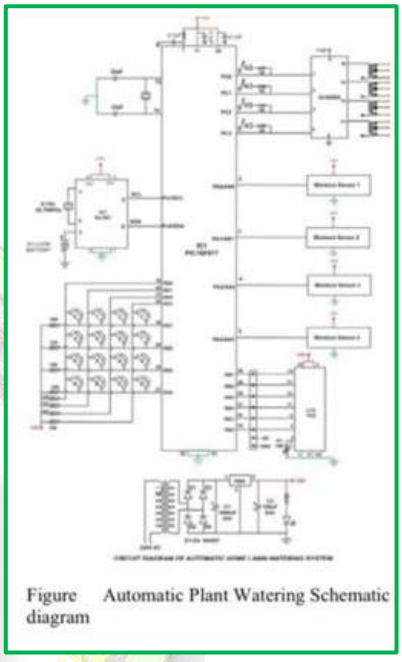

Figure Automatic Plant Watering Schematic diagram

Circuit Diagram and Working

The circuit diagram consists of a microcontroller unit that is microcontroller PIC16F877A.It is a 8 bit operation microcontroller. It has 4 ports. These ports are used to connect peripheral devices which are controlled by microcontroller 8051. We connect crystal oscillator of 3.75 MHZ to operate the microcontroller. Crystal oscillator decides the frequency at which the microcontroller works. Since this project does not require any special timing precision and speed so we choose this rating of crystal oscillator. For higher speed operation the oscillator with higher rating can be used. We add a timer circuit which takes care of real time and seasons. It tells the microcontroller the real time and microcontroller does its prescribed work at appropriate time. For timer circuit we used DS1307 Serial Real-Time Clock.At one port we add LCD which will provide the information of time and makes us to change the date and time.

At another port we connect a 4*4 keys keyboard as the port available is of 8 bit. So we cannot connect directly each key to one bit of 8 bits. So to make available all the 16 keys to microcontroller we use.

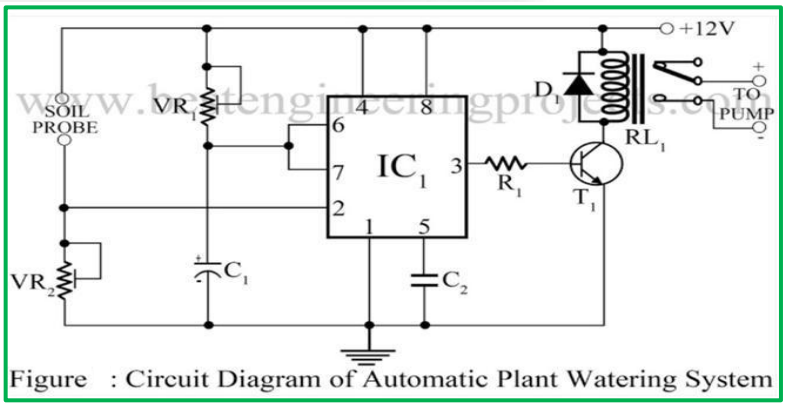

Figure : Circuit Diagram of Automatic Plant Watering System

Moisture Sensor

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. Technologies commonly used in soil moisture sensors include:

• Neutron moisture gauges, utilize the moderator properties of water for neutrons.
• Electrical resistance of the soil.
• Frequency domain sensor such as capacitance sensors.

In this particular project, we will use the moisture sensors which can be inserted in the soil, in order to measure the moisture content of the soil.

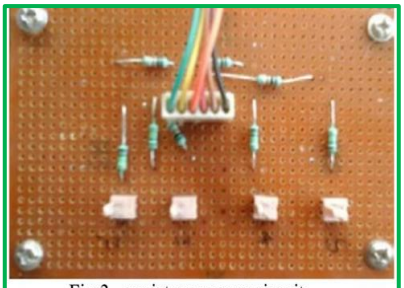

Fig 3 - moisture sensor circuit

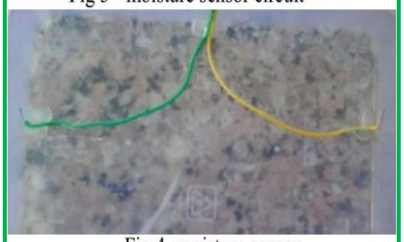

Fig 4- moisture sensor

Fig 3 - moisture sensor circuit
Fig 4- moisture sensor

Soil electrical conductivity is simply measured using two metal conductors spaced apart in the soil except that dissolved salts greatly alter the water conductivity and can confound the measurements. We will use a little bit inefficient but cheap method by measuring the voltage between the conductors in soil buried conductors.

When water comes between the two conductors then voltage difference between the two reduces and when water does not come in contact of both wires then the potential difference between the two wires increased as compared to the previous condition.

When potential difference between these two wires is low that means that there is enough water present for the plant and when potential difference is larger than that means water is lacking in plant. We can set the voltage level at which the water will be given to plant. For plant that does not need much water we can set the

Water Pump

The water pump is used to artificially supply water for a particular task. It can be electronically controlled by interfacing it to a microcontroller. It can be triggered ON/OFF by sending signals as required. The process of artificially supplying water is known as pumping. There are many varieties of water pumps used. This project employs the use of a small water pump which is connected to a H-Bridge.

The pumping of water is a basic and practical technique, far more practical than scooping it up with one's hands or lifting it in a hand-held bucket. This is true whether the water is drawn from a fresh source, moved to a needed location, purified, or used for irrigation, washing, or sewage treatment, or for evacuating water from an undesirable location. Regardless of the outcome, the energy required to pump water is an extremely demanding component of water consumption. All other processes depend or benefit either from water descending from a higher elevation or some pressurized plumbing system.

Conclusion

Thus the “AUTOMATIC PLANT WATERING SYSTEM” has been designed and tested successfully. It has been developed by integrated features of all the hardware components used. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. The system has been tested to function automatically. The moisture sensors measure the moisture level (water content) of the different plants. If the moisture level is found to be below the desired level, the moisture sensor sends the signal to the microcontroller which triggers the Water Pump to turn ON and supply the water to respective plant. When the desired moisture level isreached, the system halts on its own and the Water Pump is turned OFF. Thus, the functionality of the entire system has been tested.