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ORIGINAL ARTICLE

MICROCONTROLLER BASED TEMPERATURE DISPLAY SYSTEM FOR GREENHOUSE

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Abstract: The temperature is very important parameter required for proper growth of plants. Some of the plant requires more or less temperature as compared to other Plants. Therefore it should get the temperature as per its requirement. In traditional techniques, plants get uncontrolled temperature which affects the growth of plants. It is necessary to measure the temperature of greenhouse and control the same accordingly as per the plant requirement. Therefore, microcontroller based embedded system is designed to measure and display the temperature of greenhouse and presented in this paper.

The present embedded system is designed by using 89S52 Microcontroller and to sense the temperature LM35 is used. The voltage produced by LM35 is converted to digital form by ADC 0808. To display the temperature seven segment displays are used. The firmware is developed in assembly in Pinnacle, IDE. The results regarding implementation of an embedded system are interpreted in this paper.

Keywords: Temperature sensor, ADC, Microcontroller, Seven segments Display.

1. INTRODUCTION:-

In recent years, revolutionary changes have been taking place in the field of instrumentation for diverse application. Deploying salient features, the microcontrollers can be employed for deigning of electronic instrumentation. In short, microcontrollers are becoming an integral part of engineering design known as embedded system of dedicated application. It is known that, in greenhouse the temperature is very important for various plants. The temperature requirement of each plant is different. Therefore a digital temperature display just like a wall clock is required to note the temperature in the green house. It is possible to construct such type of a display by using a temperature sensor, ADC, microcontroller and seven segment displays. The objective of this work is to design microcontroller based system to measure and display the temperature of greenhouse. The system consists of temperature sensor LM 35 to sense the temperature of green house which is then converted into digital form by ADC 0808 and is then displayed on the seven segment display by the microcontroller 89S52.

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2. THE HARDWARE

The block diagram of an electronic circuit that is developed to measure the temperature of the greenhouse is shown in Fig (1), which consists of a temperature sensor LM-35, ADC 0808, seven segment displays and microcontroller 89S52. The temperature of green house is sensed by sensor LM 35 which is analog in nature. This analog signal is converted into digital signal by ADC (0808).The output of the ADC is given to the microcontroller 89S52 for the purpose of displaying on seven segment display.

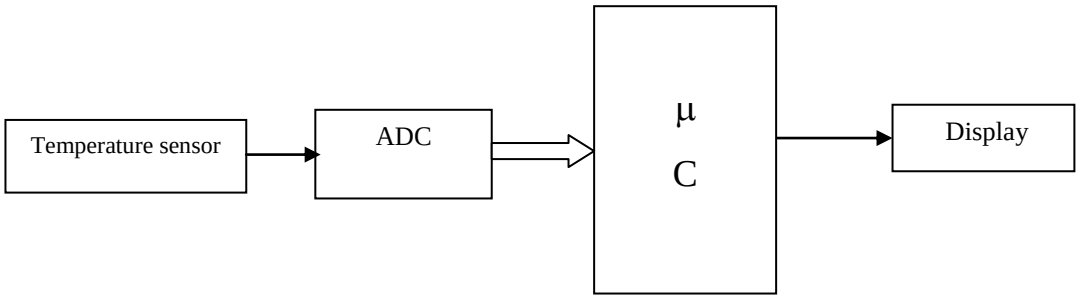

Fig (1) Block Diagram

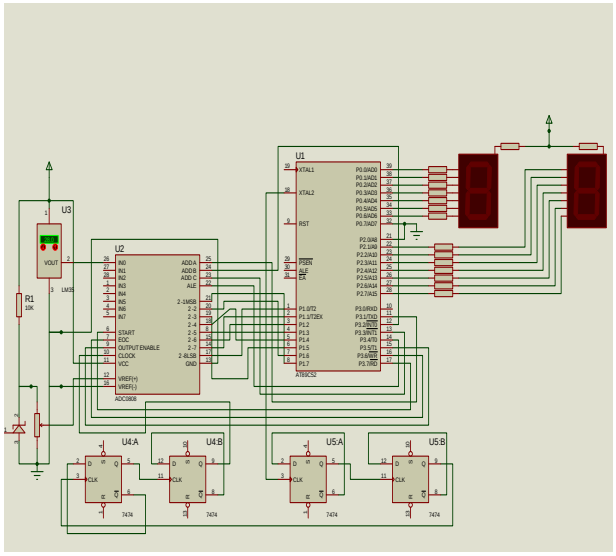

Fig (2) Schematic of the Circuit

The complete schematic of the circuit designed for present system is depicted in fig (2).The output of LM 35 is connected to 4 th channel of ADC 0808. The SOC pin of ADC is connected to pin P1.6 and EOC pin of ADC is connected to Pin P1.7of 89S52. The data lines of ADC are connected to port P3 of microcontroller 89S52. The two D flip-flops are used to produce the clock of ADC 0808 & microcontroller 89S52.The two seven segment displays are connected to port P2 and port P3 of the 89S52.

2(a) Microcontroller AT89S52:-

The AT89S52 is a low power, high performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable flash memory. The device is manufactured using Atmel-density non-volatile memory technology. The On-chip flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable flash on a monolithic chip, the Atmel AT89S52 becomes a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89S52 provides 8Kbytes of flash, 256 bytes of RAM, 32 I/O Lines, watching timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero Frequency and support two software selectable power saving modes. The idle mode stops the CPU while allowing the RAM, timer/counters, serial port and Interrupt system to continue functioning. The power-down mode saves the RAM Contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

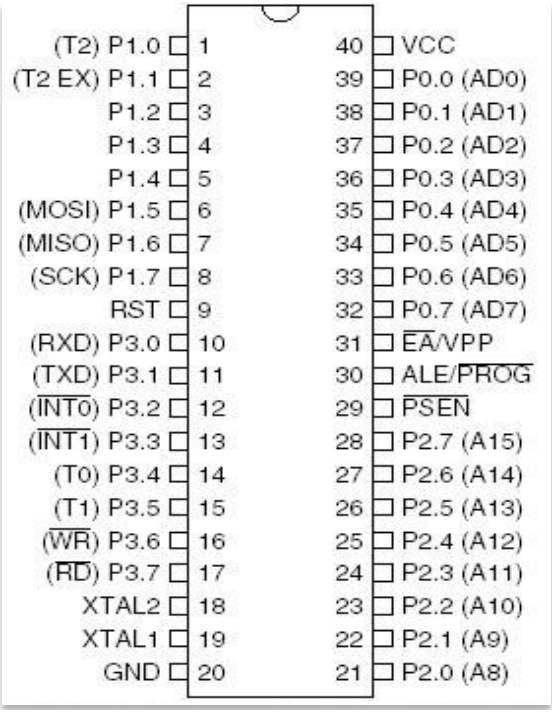

Fig (3) Pin out of AT89S52

2(b) Temperature sensor LM35:-

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (centigrade) temperature. The LM35 thus has advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of 1/4 C at room temperature and ¾ C over a full -55 to +150 ^{0}C temperature range. Low cost is

assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 microampere from its supply, it has very low self heating, less than 0.1C in still air. The LM35 is rated to operate over a -55 to +150 ^{0}C temperature range, while the LM35C is rated for a -40 to +150 C range(-10 with improved accuracy).

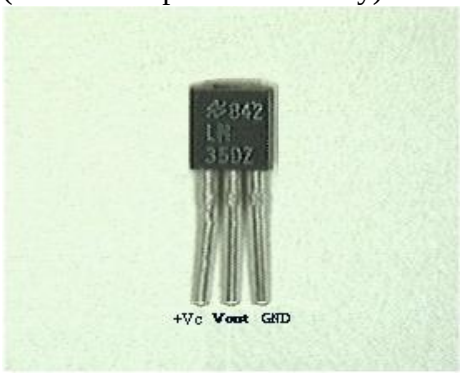

Fig (4) Pin out of LM35

2(c) ADC 0808:-

The ADC0808 is a monolithic CMOS device with an 8-bit analog to digital converter, 8-channel multiplexer and microcontroller compatible control logic. The 8-bit A/D converter uses successive approximation as the conversion technique. The 8-channel multiplexer can directly access any of single-ended analog signals. The device eliminates the need for external zero and full-scale adjustments. Easy interfacing to microcontroller is provided by the latched and decoded multiplexer address inputs and latched TTL TRI-STATE outputs. The ADC0808 is high speed, high accuracy, minimal temperature dependence, excellent long-term accuracy and repeatability and consumes minimal power.

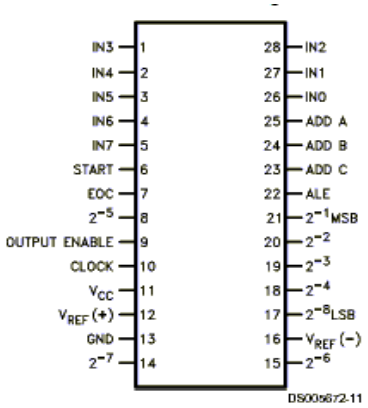

Fig (5) Pin out of ADC 0808

3. THE SOFTWARE:

To run the above system an assembly language program is developed by using Pinnacle. The temperature of greenhouse is measured and displayed on the seven segment display.

Following are the programming steps for the system.

i) Reading of the temperature through channel No 4 of ADC
ii) Conversion from analog to digital value of temperature.
iii) Display the value of temperature on display.
iv) Repeat the process continuously

4. RESULT AND DISCUSSION:

In recent years, tremendous advancement is taking place in the field of instrumentation. An embedded system can be designed for dedicated applications. Considering this fact into account microcontroller based embedded system is developed to measure and display the temperature of greenhouse. The hardware & software for the system is designed and tested successfully in the laboratory.

5. CONCLUSION

By using microcontroller 89S52, an embedded system is developed to measure and display the temperature of greenhouse. The results obtained are satisfactory and the system works continuously to measure and display the temperature of greenhouse.

6. REFERENCES

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