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A

Seminar report

On

Industrial Automation

Submitted in partial fulfillment of the requirement for the award of degree
Of Civil

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Acknowledgement

I would like to thank respected Mr…….. and Mr. ……..for giving me such a wonderful opportunity to expand my knowledge for my own branch and giving me guidelines to present a seminar report. It helped me a lot to realize of what we study for.

Secondly, I would like to thank my parents who patiently helped me as i went through my work and helped to modify and eliminate some of the irrelevant or un-necessary stuffs.

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Next, I would thank Microsoft for developing such a wonderful tool like MS Word. It helped my work a lot to remain error-free.

Last but clearly not the least, I would thank The Almighty for giving me strength to complete my report on time.

Preface

I have made this report file on the topic **Industrial Automation ;** I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to ……..who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

Industrial Automation

ABSTRACT

Temperature dependent workplaces are the heart of industrial civilization. Powerful and controllable energy source are the most important demand of an industry. Boiler, heat exchangers provide this energy to these industries. The temperature of these sources must be controlled by means of controlling the heater coils or the flame so that it cannot damage complete system by excessive heating or else. Various temperature controlling system are hence employed to achieve this objective.

The basic concept is to sense the current status of the system and to control the source generating the heat. Various extra enhancement are like provision of a set point Valve; display status on screen etc. can be added.

The phenomenon of temperature sensing is not measurable by basic standards method, direct comparison purpose. When a Body gets heated or cooled various primary effects take place and one of these effects can be employed for measuring purpose like,

1. Changing in physical or chemical state
2. Change in dimensions
3. Variation in electrical properties
4. E.M.F. generation
5. Change in intensity of total radiation emitted

The various sensors that can be used are of type

1. Mechanical type
2. Liquid in glass thermometer
3. Liquid filled system
4. Vapor pressure thermometer
5. Resistance type temperature sensor
6. Thermostat
7. Thermocouples

In older days, mechanical system were used to control these system. But the controlling action was not so precise and accurate. Further electronic based system are invited. Which are far better than those older mechanical systems hence implemented regularly and became common. Now a day microcontroller based automated precise temperature controlling systems are used.

CONTENT

INTRODUCTION

The temperature of substance or medium is a phenomenon expressing its degree of hotness or coldness and it related with reference to its power of commenting heat to surrounding. It is one of the fundamental parameters , denoting physical conditions of matters ,similar to mass ,length and time.

However temperature denotes basically an intensive property of matters .it is measure of the mean kinetic energy of molecules of substance & represents the potential of heat flow. Temperature sensing based on methods of measuring energy radiation from a hot body.

Heat exchangers , boilers, room temperature controller, warmer controller are very known type of some temperature controlling systems. These temperature controlling system are often used in industries whereas in day to day life too. The very basic step evolved in such systems is controlling the temperature of the device which causes the heating action, which in turn helps regulating the system temperature at some predefined value.

Now a day's various analog and digital temperature controllers are used , which helps to maintain the required temperature of system by means of some controlling action and provide precise temperature control.

Below are some examples of temperature controlling systems discussed in brief :-

1. Warmer control system:-

This system is used to maintain a temperature of glass chamber (incubator) Where pre born babies are kept , these pre –born babies are very sensitive to environment & can be infected easily by various bacteria's if kept open at room temperature . hence they are kept in such chambers for protection .the temperature of this chamber is kept at precise 37°C .

2. Medicine storing units:-

In medical fields where some medicines has to be stored at precise temperature hence are kept in such medicine storing units whose temperature is controlled by standard temperature controlling .In our temperature controlling system we are controlling the

Heater's heating action maintain the temperature. A transducer is used to sense the current temperature of the system, which is further compared with the reference set temperature .a proper controlling action is taken by controlling switching system used to on or off the heater.

LIST OF FIGURE:-

LIST OF TABLE:-

LITERATURE SURVEY:

Various temperature controlling systems available in market are:

1. **Discrete type (semi-automatic) :-**

In this type a comparator schematic of an op-amp is used for comparing and controls action. Lowest 1 star rated system. Low in efficiency, No extra protections such as leakage, over-current, Overheat, power loses, provided.

2. **Discrete type (automatic) :-**

In this type a regulating pulse width modulator IC is used for taking controlling action. Moderately 3 star rated systems.Moderate in efficiency. Some extra protections such as over-current, overheat, are provided.

3. **Microcontroller based (fully automatic) :-**

This is most significant type, contains a microcontroller based fully Automatic digital controlling system. Highly 5 star rated systems.Highly efficient, all extra protections such as leakage, over- Current, overheat, power loses are provided.

BLOCK DIAGRAM:-

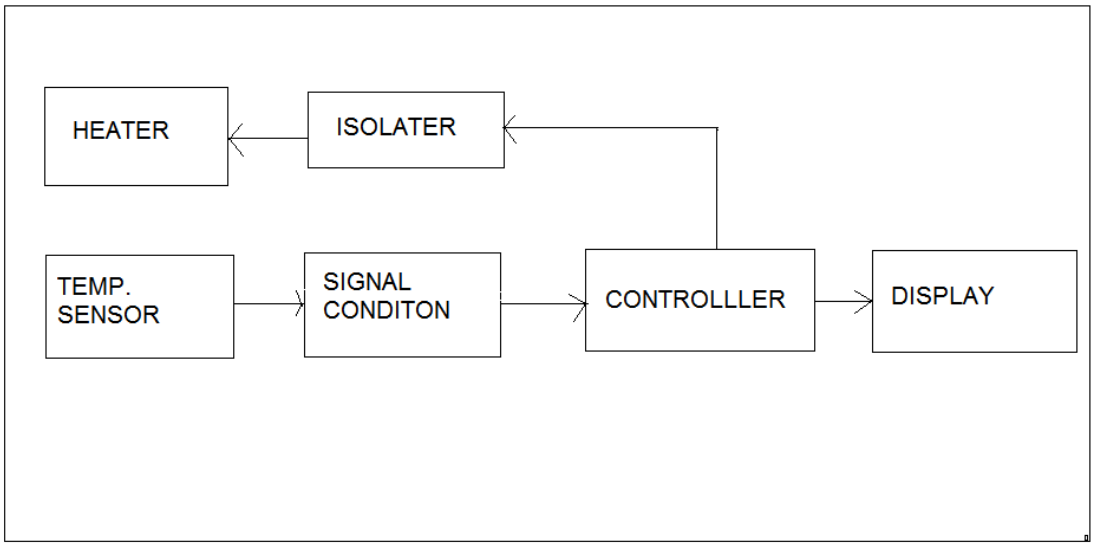


FIG.1. BLOCK DIAGRAM

BLOCK DIAGRAM DESCRIPTION:

1. Heater:-

Heater is used as i/p to system .The heater should be such that heat delivered to the system can be precisely controlled by the controlling network.

2. Temperature sensor:-

The surrounding temperature of heater is sense by sensor and corresponding output is produced (in mv).

3. Signal conditioning circuit:-

The electrical signal o/p available from sensor is normally very low in terms of signal voltage .hence to provide standard o/p voltage signal conditioning circuit is used .The disadvantages of signals conditioning circuit is very low noise pickup and high SNRAnd ease of use from system designer point of view.

4. Buffer:-

Buffer is nothing but non-inverting unity gain amplifier which is used to avoid loading effect on o/p side, it also increases driving capacity of circuit.

5. Controller:-

The required set point temperature is given to controller and output of signal conditioning circuit is also given to controller by comprising this two, controlling feedback is given to heater through feedback network.

6 Display:-

The required set point temperature and current temperature of system is displayed on LCD display.

HARDWARE REQUIRED:-

1. Transducer:-

Required temperature range: 27°C to 38°C

Devicechosen: LM35

2. Signal conditioning:-

Required parameter: high i/p impedance, low noise pickup, high SNR

Device chosen: LM358

3. Controller:-

Voltage range: 4v to5.5v

Devicechosen: 89c52

4. Feedback network:-

Required feedback network: isolation between circuit and ac line.

Smooth switching between loads.

Device chosen: MOC 3041

5. Display:-

Required display digit range.

Devicechosen: 16*2 LCD display

SOFTWARE REQUIRED:-

MIDE-51, FLASH MAGIC

DETAILED FUNCTION OF EACH BLOCK:-

1. TRANSDUCER (LM35):-

It is nothing but temperature sensor. It is used to sense the temperature of heater and produce O/P in terms of voltage. This is linearly proportional to the temperature.

Feature of LM35:-

1. Calibrated directly in ° Celsius (Centigrade)

2. Linear + 10.0 mV/°C scale factor

3. 0.5°C accuracy.

4. Rated for full −55° to +150°C range

5. Operates from 4 to 30 volts

6. Low self-heating, 0.08°C in still air

7. Nonlinearity only ±1⁄4°C typical

BLOCK OF LM35 USED AS:-

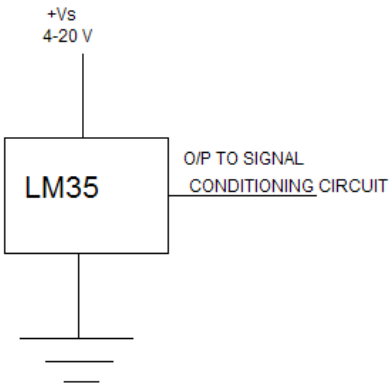


FIG. 2 CONNECTION OF LM35

2.AMPLIFIER (LM358):-

Due to weak O/P voltage of temperature sensor it is necessary to amplify it. For this amplifier (LM358) used which has following features.

1. High I/P impedance.
2. Very low O/P impedance.
3. Accurate , stable & adjustable high gain
4. Extreme high C.M.R.R.
5. Adequate bandwidth
6. High linearity
7. Facility for span adjusting for calibration purpose

BLOCK OF AMPLIFIER (LM 358):-

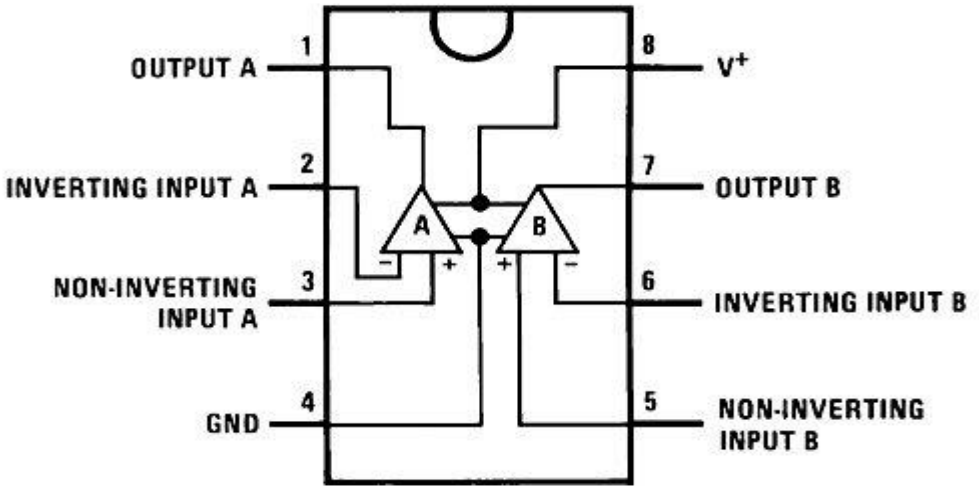


FIG. 3 PIN DIAGRAM OF LM358

3.OPTOISOLATOR (MOC 3041):-

It is 6 –pin zero –crossing detector,optoisolatortriac driver IC. It consist of arsenide infrared light emitting diode optically coupled to monolithic silicon detector performing function of zero voltage crossing bilateral triac driver hence , dependingOn duty cycle of (%D) PWM wave , it drives triac by selecting corresponding firing angle of triac.

Advantages of optoisolator are:-

1. it is electrically isolating PWM controller from high power device i.e. heater
2. due to unidirectional signal transfer to output side i.e. to PWM controller
3. it is small in size & light weight device
4.

Features:-

1. Simplified logic control of 115V power.

2. Zero voltage crossing.
3. DV/dtof 2000V/µstypically, 1000v/ µsguaranteed.

BLOCK OF MOC-3041 USED AS:-

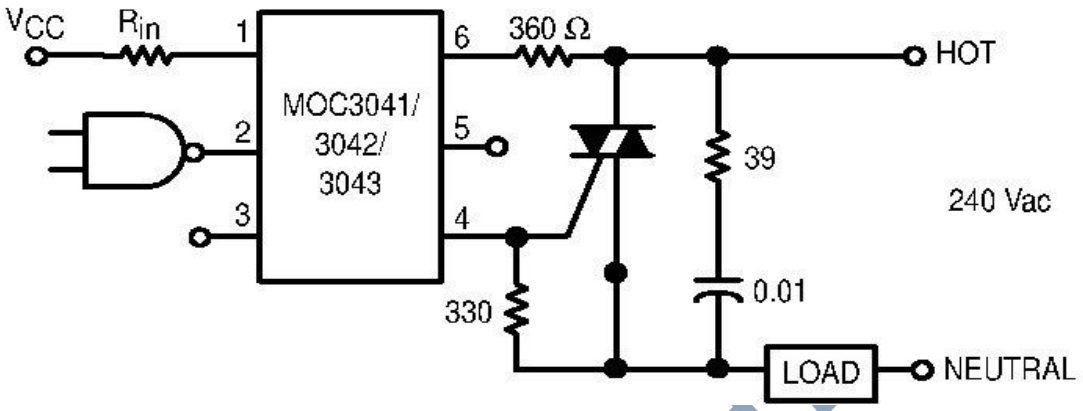


FIG. 4 BLOCK OF MOC3041

Pin no.1 is connected to Vcc& pin no.2 is connected to 180 phase shift of PWM wave i.e. Inverted wave of PWM O/P. When voltage pin 1&2 is present, corresponding diode emits infrared producing gate current to triac to turn it on. Depending gate current values it select firing angle & as heater & supply is connected in series with Triac , heater gets supply only for this firing angle and controlling is achieved.

To pin no. 2 inverted PWM O/P is connected if Di% of duty cycle is at O/P then we have to send gate current proportional to Di% of cycle.

Gate current α V1- V2

As V1=Vcc=constant

Gate current α-V2

I.e. Gate current α 1/V2

But V2 is inverted PWM O/P

Therefore, V2 =1/D1

Therefore, gate current α 1/(1/D1)

Therefore, gate current α D1

For MOC 3041 input current should not exceed to 15ma, for 100% duty cycle. But in our circuit maximum duty cycle is

Therefore, Rin = Vc/If

=5/35

$=0.2 \times 10^3$

Therefore, Rin=200Ω

Ci capacitor is used for snubbing of Triac

4.ANALOG TO DIGITAL CONVERTER(ADC0809):-

The ADC0808, ADC0809 data acquisition component is amonolithic CMOS device with an 8-bit analog-to-digital converter,8-channel multiplexer and microprocessor compatiblecontrol logic. The 8-bit A/D converter uses successive approximationas the conversion technique. The converter features high impedance chopper stabilized comparator, a256R voltage divider with analog switch tree and a successiveapproximation register. The 8-channel multiplexer candirectly access any of 8-single-ended analog signals.

The device eliminates the need for external zero andfull-scale adjustments. Easy interfacing to microprocessorsis provided by the latched and decoded multiplexer addressinputs and latched TTL TRI-STATE® outputs.

Features:-

1. Easy interface to all microprocessors

2. Operatesratio metrically or with 5 VDC or analog spanAdjustedvoltage reference

3. No zero or full-scale adjust required

4. 8-channel multiplexer with address logic

5. 0V to 5V input range with single 5V power supply

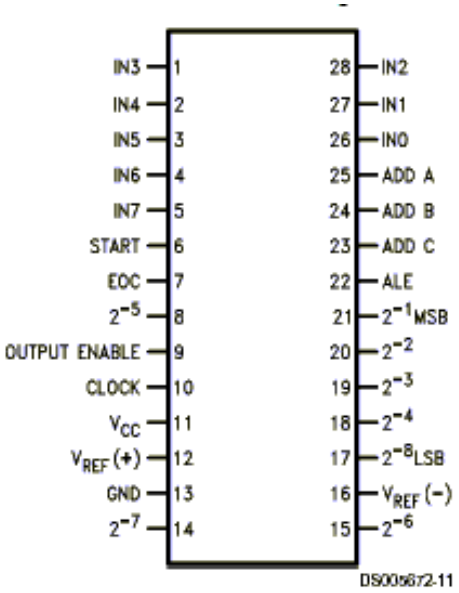


FIG. 5 PIN DIAGRAM OF ADC0809

4.MICROCONTROLLER(AT89C52)

The at89c52 is a low-power, high-performance cmos 8-bit microcomputer with 8k bytes of flash programmable and erasable read only memory (perom). The device is manufactured using Atmel's high density nonvolatile memory technology and is compatible with the industry standard 80c51 and 80c52 instruction set and pin out. The on-chip flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with flash on a monolithic chip, the Atmel at89c52 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications.

Features:-

1. Compatible with MCS-51™ Products

2. 8K Bytes of In-System Reprogrammable Flash Memory

   – Endurance: 1,000 Write/Erase Cycles

3. Fully Static Operation: 0 Hz to 24 MHz

4. Three-Level Program Memory Lock

5. 256 x 8-Bit Internal RAM

6. 32 Programmable I/O Lines

7. Three 16-Bit Timer/Counters

8. Eight Interrupt Sources

9. Programmable Serial Channel

10. Low Power Idle and Power Down Modes

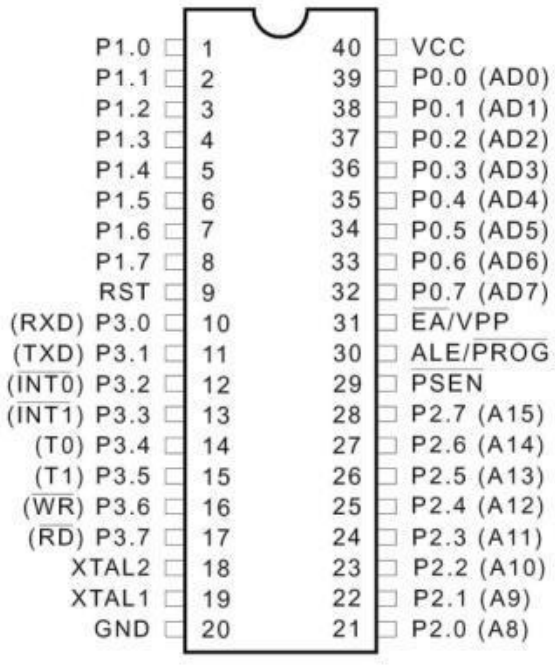


FIG.6. PIN DIAGRAM OF AT89C52

4.TRIAC (BT139):-

Depending on gate current supplied by MOC3041 OPTO-ISOLATOR, firing angle is adjusted and conducting angle is set & send heater, for which heater conducts only & hence temperature controlling is achieved.

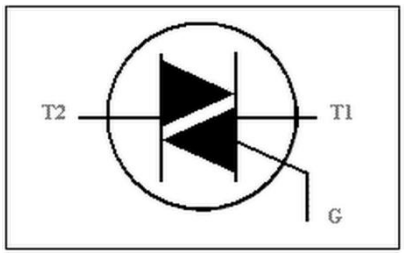


FIG.7. SYMBOL OF TRIAC

ALGORITHM

1. Start

2. Set the desired temperature

3. Lm35 will sense the room temperature

4. This room temperature is given to LM358. As output of LM35 is low.

5. Output of LM358 is given to ADC0809 to convert the analog signal into digital.

6. Digital signal is then provided to at89c52 .this IC processes the data and producing PWM waves accordingly.

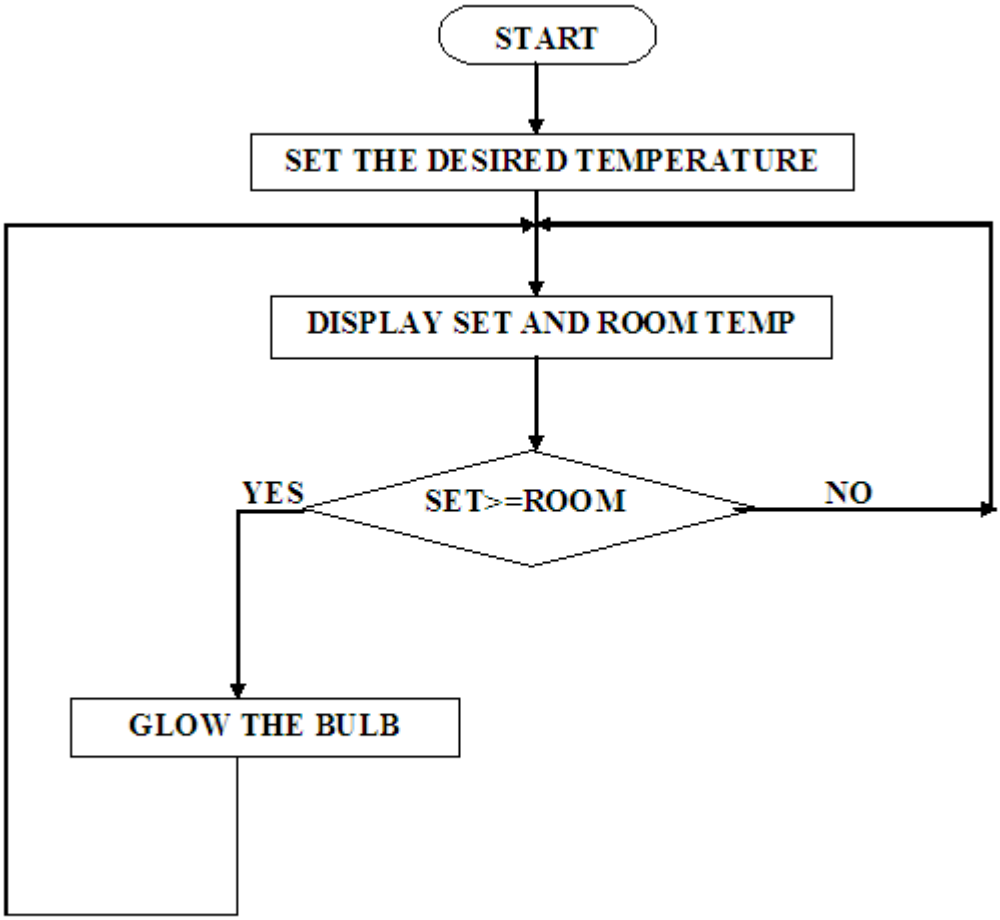
7. PWM is given to moc3041 which sets the firing angle

8. According to firing angle triac starts conducting

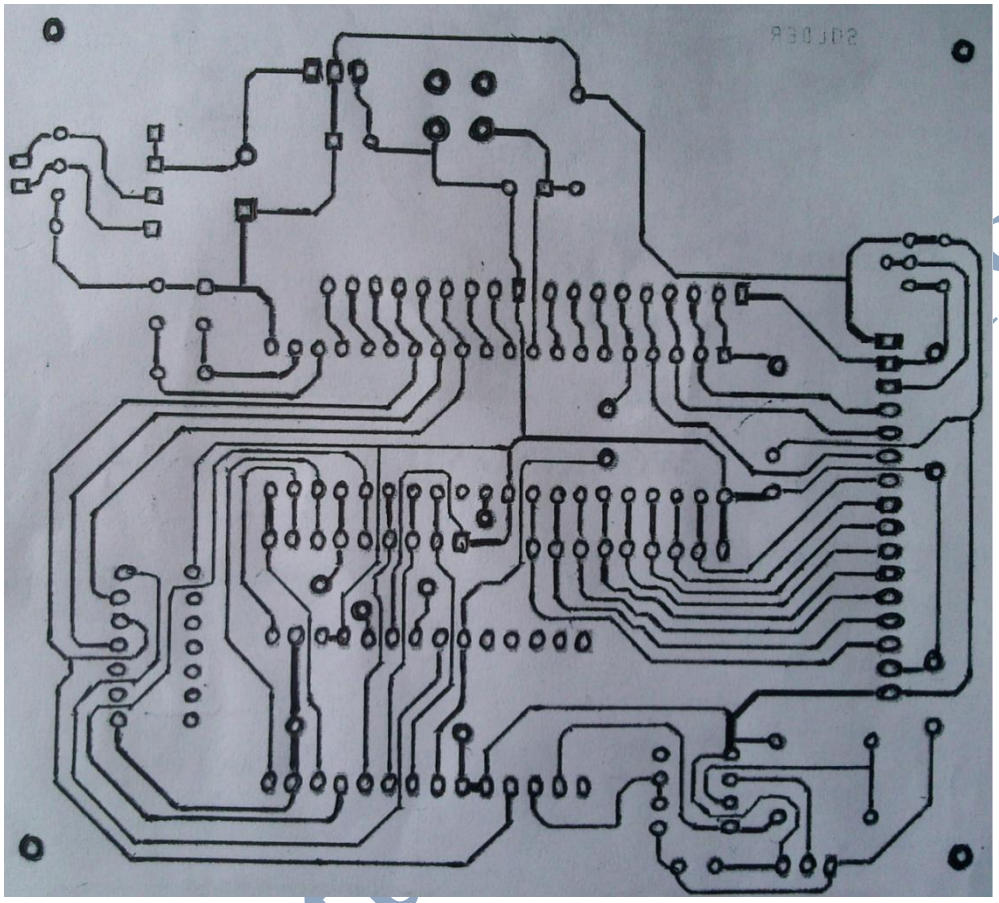
9. We get output till the triac conducts.

10. Blub glow till the room temperature > set temperature

FLOW CHART:



PCB DESIGN:-



SPECIFICATIONS:-

Devices	Inputs	Output
TRANSDUCER (L M - 35)	27˚C to 38˚ C	10.0 mV/°C
AMPLIFIER (LM – 358)	20mV to 100mV	0-3.8V DC
MICROCONTROLLER (89C52)	4Vto5.5V DC	1.PWM of 50Hz 2.O/P for LCD
OPTOISOLATOR (MOC-3041)	1. 5V DC 2. PWM From 89c52	Triac gate driver Current up To 100mA
TRIACE (BT-139)	230 V AC	230V Controlled AC
DISPLAY	From 89c52	16*2 lines Display
ADC	20mV to 100mV from LM-358	O/P in binary Form for 89c52

TABLE.1 . SPECIFICATIONS

COST ESTIMATION :-

COMPONENT USED	VALUE	QUANTITY	RATE	COST
R1	220Ω	1	0.50	0.50

R2	330Ω	2	0.50	1.00
R2	2.2KΩ	1	0.50	0.50
R4	10KΩ	2	0.50	1.00
R5	11KΩ	1	0.50	0.50
PULL UP	10KΩ	1	8	8
C1	1000uF	1	0.50	0.50
C2	220 uF	1	0.50	0.50
C3	10uF	1	0.50	0.50
C4	0.1uF	2	0.50	1.00
C5	33nf	2	0.50	1.00
C6	0.1nF	1	3.00	3.00
Q1	BC547	1	5	5
IC1	LM-35	1	40	40
IC2	LM-358	1		
IC3	89C52	1	50	50
IC4	MOC-3041	1	10	10
IC5	BT139	1	12	12
DISPLAY	LCD	1	40	40
TRANSFORMER	0-9V	1	40	40
BULB	60 W	1	15	15
PCB DESIGNING	-	1	600	600
CABINET	10”×8”×4”	1	150	150
SWITCHES	PUSH	3	2	8

TABLE.2 . COST ESTIMATION

CONCLUSION:-

Thus through our project we can control the temperature of any closed chamber andhence the desired temperature can be provided to the chamber. So it can be used in any placewhich requires a precise temperature to be set .eg. incubator , medicine storage , textile industries etc.

we set the temperature to a desired temperature and as the room temperature in less than the desired one , bulb connected will glow and provide the required temperature, this will last as long as temperature of room is less then desired , after this bulb will automatically switch off.

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APPLICATIONS :-

1. Warmer Controller Systems.(Controlling parameters of incubator)

2. In domestic applications like controlling room temperature and humidity.

3. As water Heating system for aquarium.

4. To control precise temperature in medicine and chemical industries.

5. In textile industries (for silk production)

6. In air conditioning and water cooler system to make system automatic and independent.

FUTURE MODIFICATION :-

1. Improved temperature range.

2. Can also be used I in controlling temperature of different liquids.

3. Parameters can be operated by remote control.

4. Compact design

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