INTRODUCTION

The rising demands for crop production and quality have significantly increased the utilization of high quality and productivity of green house. The system which we proposed helps us to closely monitor and control the microclimatic parameters of a greenhouse environment. The system comprises of sensors, microcontroller with inbuilt ADC and actuators (motors, led). When temperature crosses a safety threshold which has to be maintained to protect the crops, the sensors sense the change and the micro-controller reads this from the data at its input ports after being converted to a digital form by the ADC. The controller then performs the required actions using actuators until the strayed-out parameter has been brought back to its most optimum level. Our proposed system aim is to design a microcontroller-based circuit to monitor and record the values of temperature of the natural environment that are continuously modified and it is get controlled in order optimize them to achieve maximum plant growth and yield.

BACKGROUND

Since 1990’s for greenhouse and environment monitoring various kinds of system have been developed but due to lack of awareness, cost and implementation factors, these systems were left behind. Introducing this system can help in increasing the cultivation in a controlled environment. Required environmental conditions like Respiration for plants are necessary for optimum plant growth, improved crop yields, and efficient use of water and other resources. Low soil temperatures can inhibit water absorption in plants .Automating the data acquisition process of the soil conditions and various climatic parameters that govern plant growth allows information to be collected with less labour requirements. Automatically controlling all the factors that affect plant growth is also a difficult task as it is expensive and some physical factors are interrelated .Because the temperature of greenhouse must be constantly monitored to ensure optimal conditions.The data from the greenhouse will be measured by the sensor. The data that has been read will be displayed on the LCD screen. By using this system, the process of monitoring is easier and it is also cheaper for installation and maintenance process.

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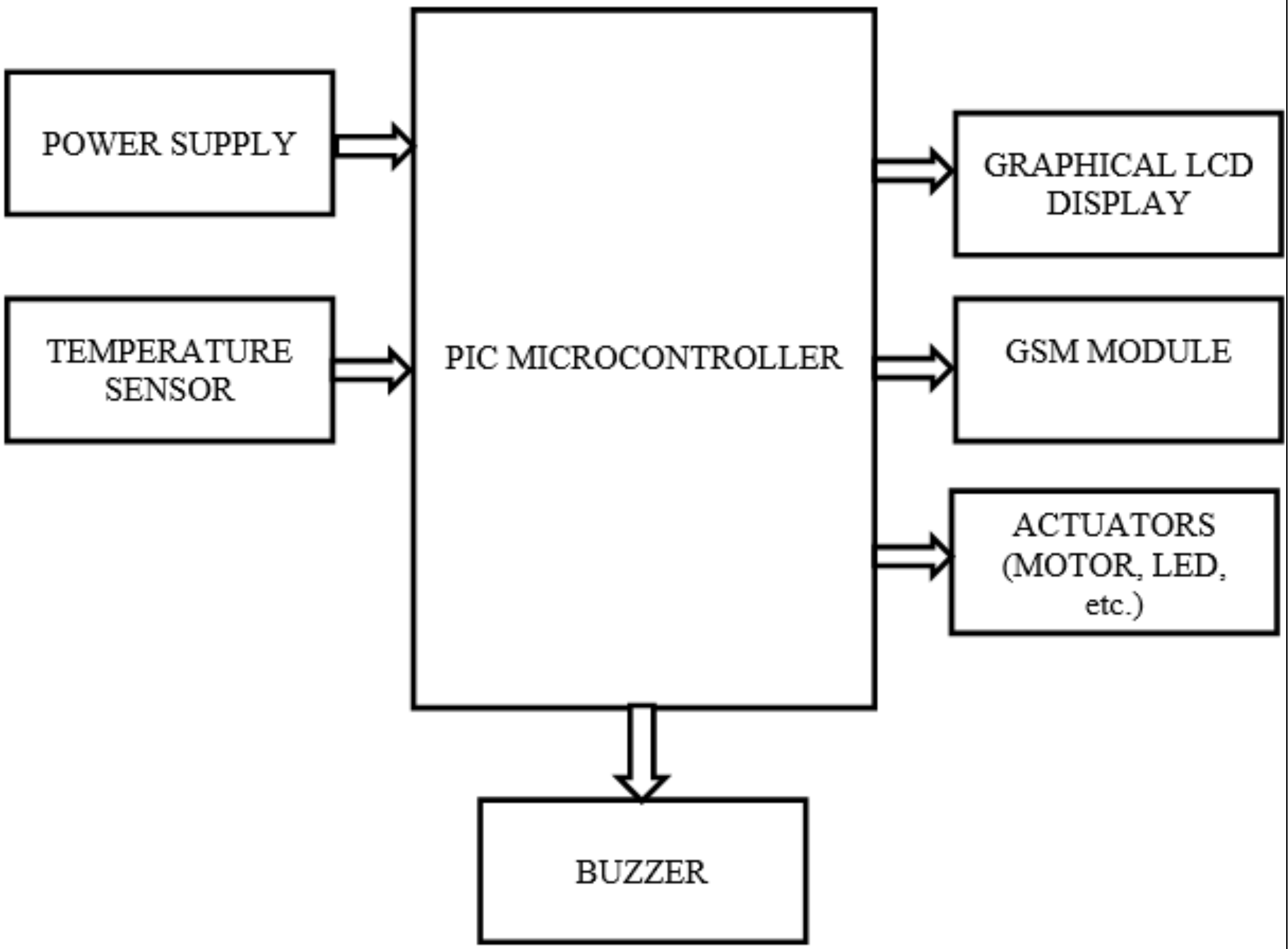
BLOCK DIAGRAM



BLOCK DIAGRAM DESCRIPTION

MICROCONTROLLER:

It is brain of our project. This is used to interface Buzzer and DC motor through relays and interfacing Graphical LCD as well as GSM module. It receives signals from temperature sensor and gives control signal to output peripherals according to the program debugged.

POWER SUPPLY :

This is the block used for supplying power to the microcontroller and the driver circuit. Power supply is converting 230V ac voltage to 12V,-12V and 5V Dc supply.

DC MOTOR:

It is a 5 volt dc motor with 2000 rpm. Its full load current 200mA .

TEMPERATURE SENSOR:

Temperature sensor used is LM35 with resolution 10mV/ºC. Output is in the form of analog voltage.

ULN2003 :

ULN2003 is a driver IC which is used to drives dc motor and Relay.

GLCD:

JHD12864 Graphical LCD is used. It is used to display real time temperature.

GSM MODULE:

GSM module used is SIM900. It is used to send message to the dedicated mobile handset.

ELECTRONIC AND HARDWARE DESIGN ASPECTS

PIC SELECTION:

Parameter	PIC16F688	PIC16F877	PIC18F4550
Pin count	14	28/40	40/44
Operating voltage	2V-5.5V	2V-5.5V	2v-5.5v
Operating frequency	0 to 20MHz	0 to 20MHz	0 to 48MHz
Inbuild ADC	8	8	13
ADC Bits	10	10	10
No. of timers (8/16)	1/1	3/0	1/3
Program memory	4k	8k	32k
Data memory	256(SPRAM),256(EEPROM)	368(SPRAM),256(EEPROM)	2048(SPRAM),256(EEPROM)

From this comparison we are selecting the PIC 18F4550 which satisfied our project requirement.

LPS CALCULATIONS

1) **INPUT VOLTAGE :**

$Vin(min) = Vo + Vdrop + 1V$

$= 12 + 2 + 1$

$= 15V$

$Vin(min) = Vo + Vdrop + 1V$

$= 5 + 2 + 1$

$= 8V$

2) RIPPLE ALLOWABLE:

$RR = 20log\left(\frac{Vrpp\_in(max)}{Vrpp}\right)$

a) **FOR 7812**

$55 = 20log\left(\frac{Vrpp\_in(max)}{0.005}\right)$

$Vrpp\_in(max) = 2.7V$

b) **FOR 7805**

$62 = 20log\left(\frac{Vrpp\_in(max)}{0.005}\right)$

$Vrpp\_in(max) = 6.15V$

3)CAPACITOR:

$$c = \frac{I}{2fVrpp\_in(max)}$$

= 2200uF

POWER BUDGET

Components	Voltage	Current	Power
PIC18F4550	5V	25mA	0.125W
LM35	5V	10mA	0.05W
GLCD	5V	200mA	1W
GSM	12V	500mA	6W
DC Motor	5V	100mA	0.5W
Buzzer	5V	50mA	0.25W
			Total = 7.925 W

SOFTWARE ASPECTS

1**. PROTEUS:**

Proteus provides a virtual hardware environment to check the liability of the code before implementing it on the actual hardware .The Hex. File generated by Micro software is used for real time simulation.

2. **ALTIUM DESIGNER-**

PCB designing is performing using the Altium Designer. PCB layout is generated against the block schematic created in the Altium editor. The track dimensions are maintained as required.

3. MPLAB FOR PIC:

The code is written in the MPLAB which is compiled to check for errors. The hex file is generated by the software for the error free code which Is used during hardware implementation.

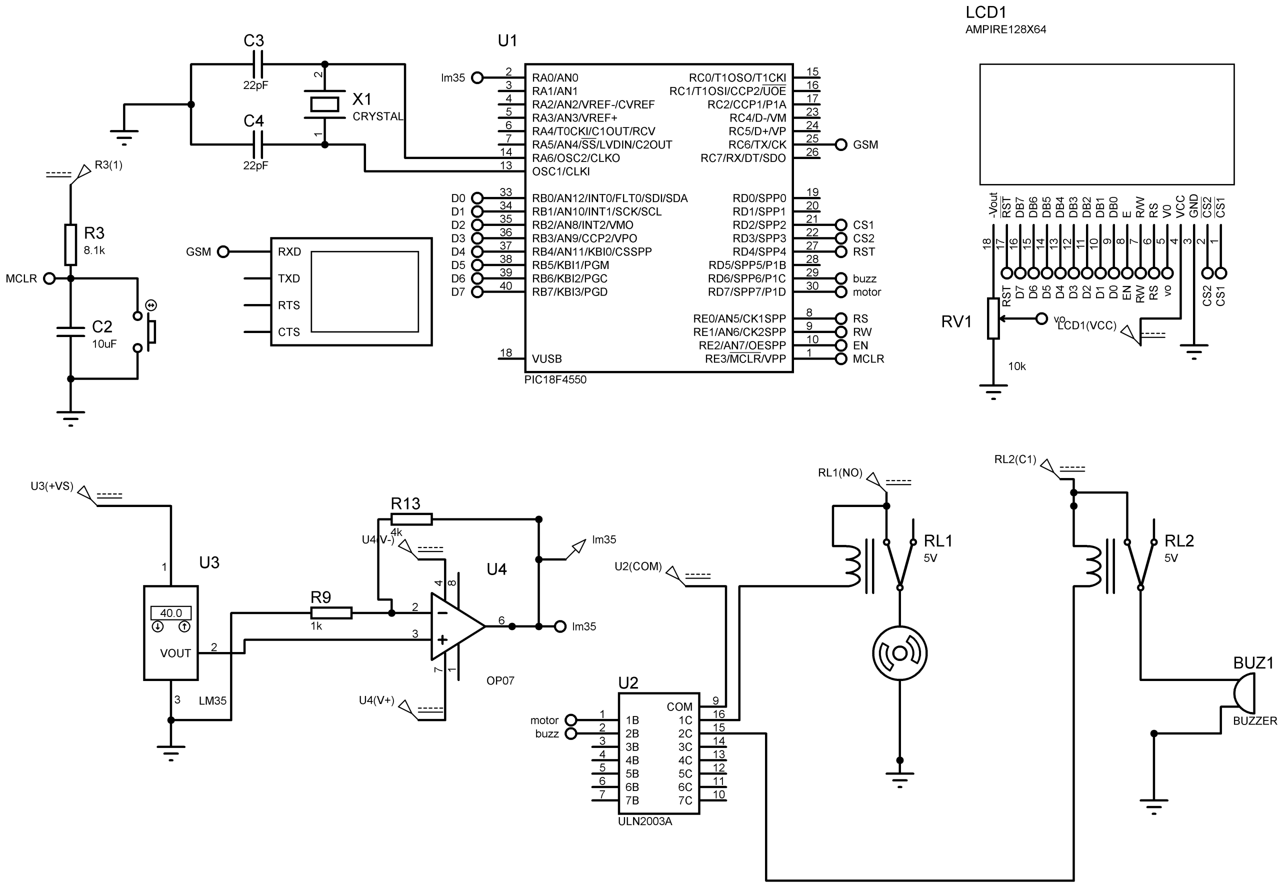
4. BMP-LCD:

BMP-LCD software is used to convert monochrome image of 128*64 resolution to array of hex numbers.

ALGORITHM OF CODE

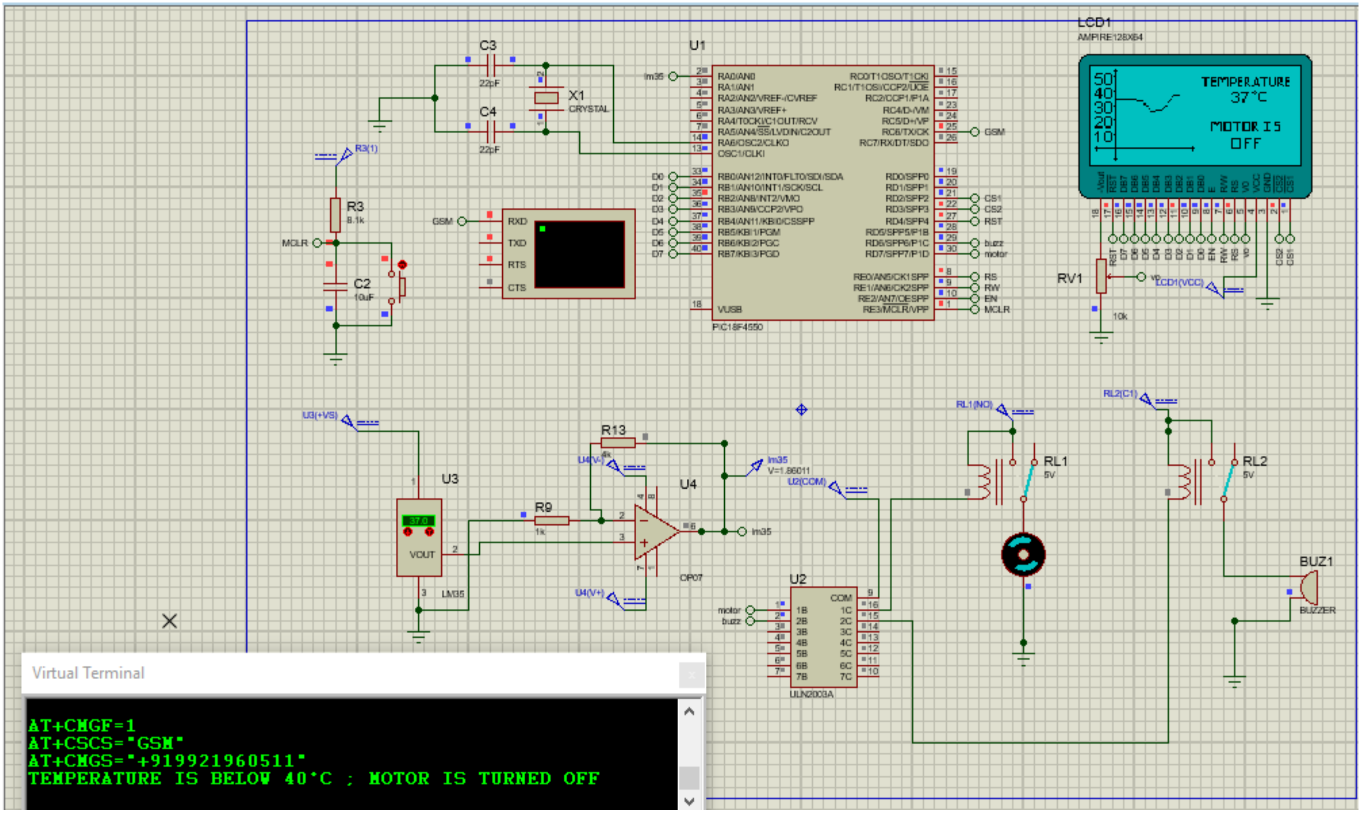
1. Start the system.
2. Measure present temperature using LM35 output and Inbuilt 10 bit ADC
3. If temperature is below 40ºC then send sms using GSM that "TEMPERTURE IS BELOW 40ºC, MOTOR IS OFF" and also turn OFF the motor and buzzer.
4. If temperature is above 40ºC then send sms using GSM that "TEMPERTURE IS ABOVE 40ºC, MOTOR IS ON" also turn ON the motor and buzzer.
5. Display present temperature on GLCD in graphical format. Also display Temperature value as well as motor status.
6. Go back to step 2.
7. Stop

CIRCUIT DESIGN

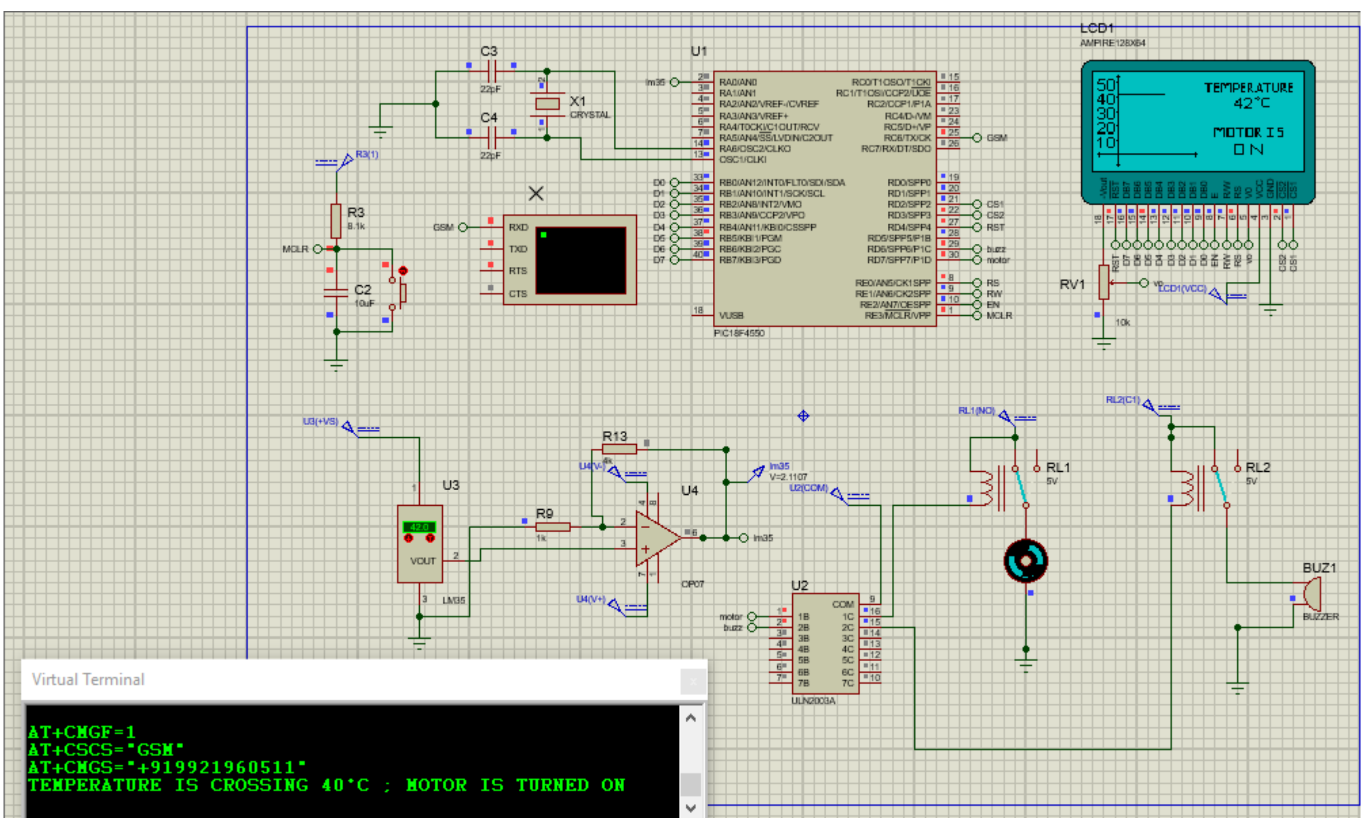


SIMULATION RESULTS

CASE I :



CASE II :



PCB DESIGN

This Project consists of three PCBs namely the *Main* PCB, *Relay Driver Circuit* PCB and *Power Supply* PCB. PCB dimensions, clearance, track width, hole size, pad size, etc. are the various parameters we looked upon while designing the PCB.

MAIN PCB:

1. PCB Dimension: 13.97cm X 7.62cm
2. Track Width:0.6mm
3. Clearance:0.6mm

The main PCB is powered by +5V obtained from the power supply PCB.

This module includes PIC microcontroller and connectors for relay circuit GLCD and GSM. Considering moderate handling, the track width is kept equal to 0.7mm.

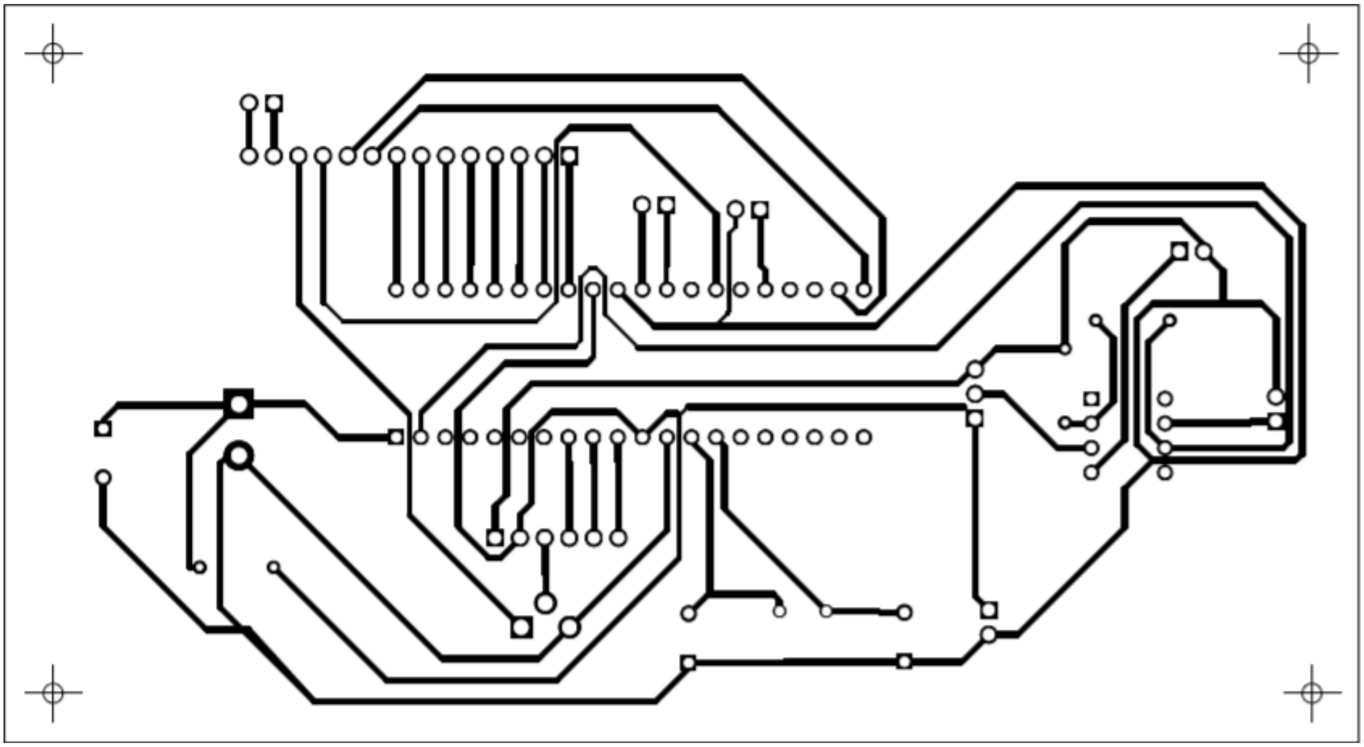
POWER SUPPLY PCB:

1. PCB Dimension: 9.398 cm X 6.096 cm
2. Track Width:0.8mm
3. Clearance:0.8mm

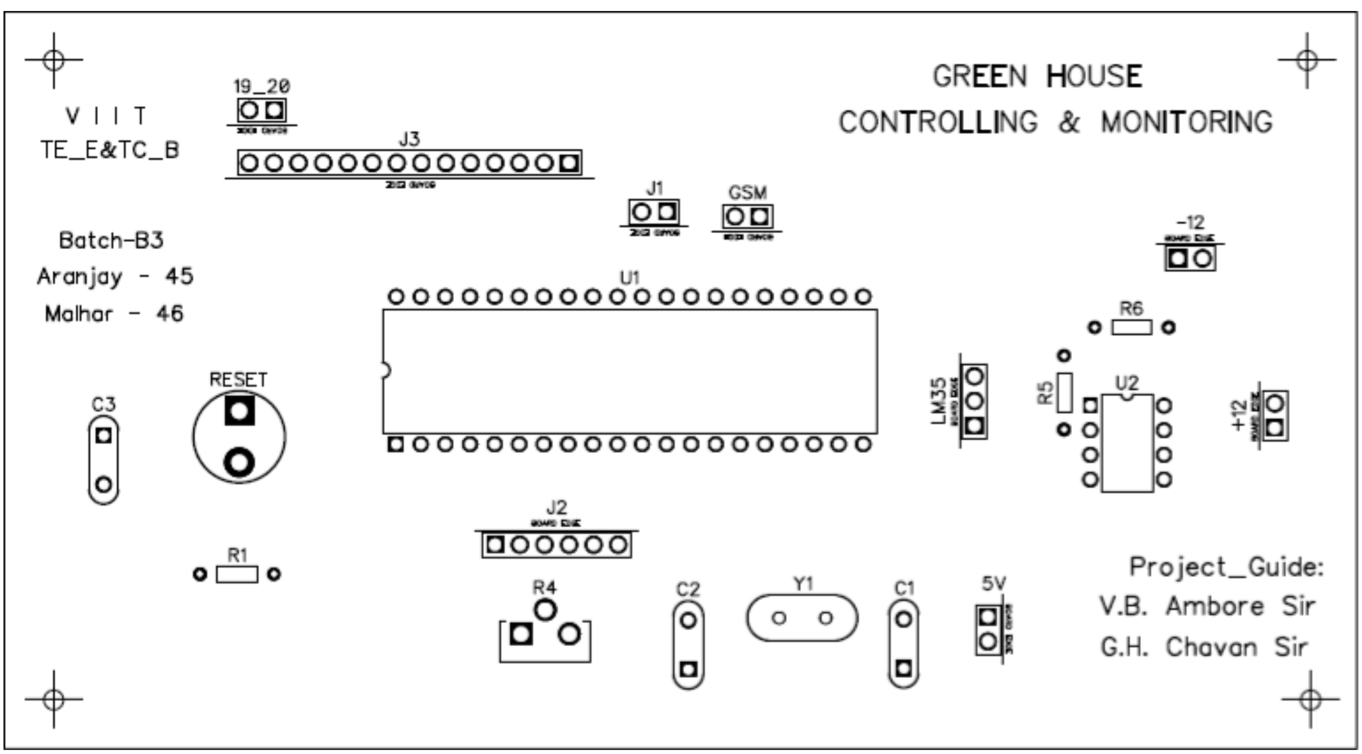
This PCB contists of circuitary for conversion of AC mains voltage to a regulated +5V ,+12v as well as -12V DC supply.

1. **MAIN PCB**

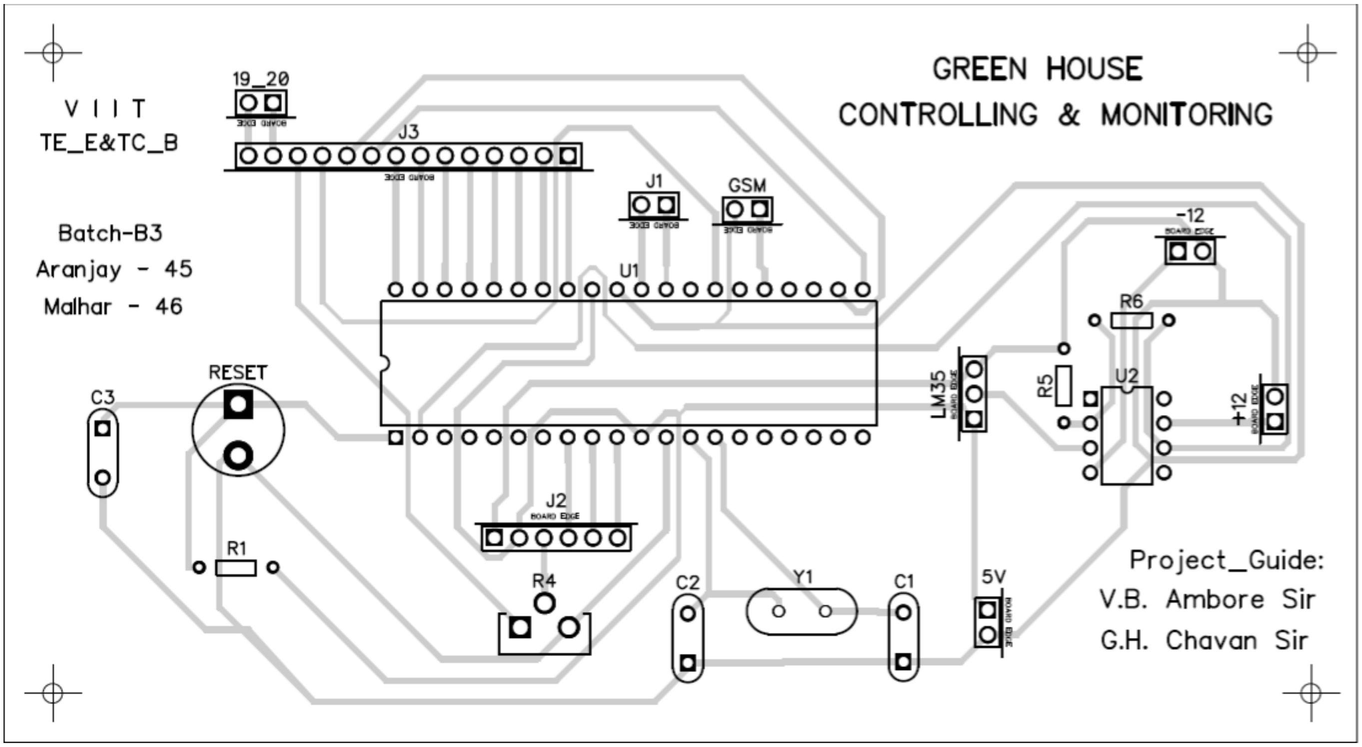
- **BOTTOM LAYER:**



TOP LAYER:

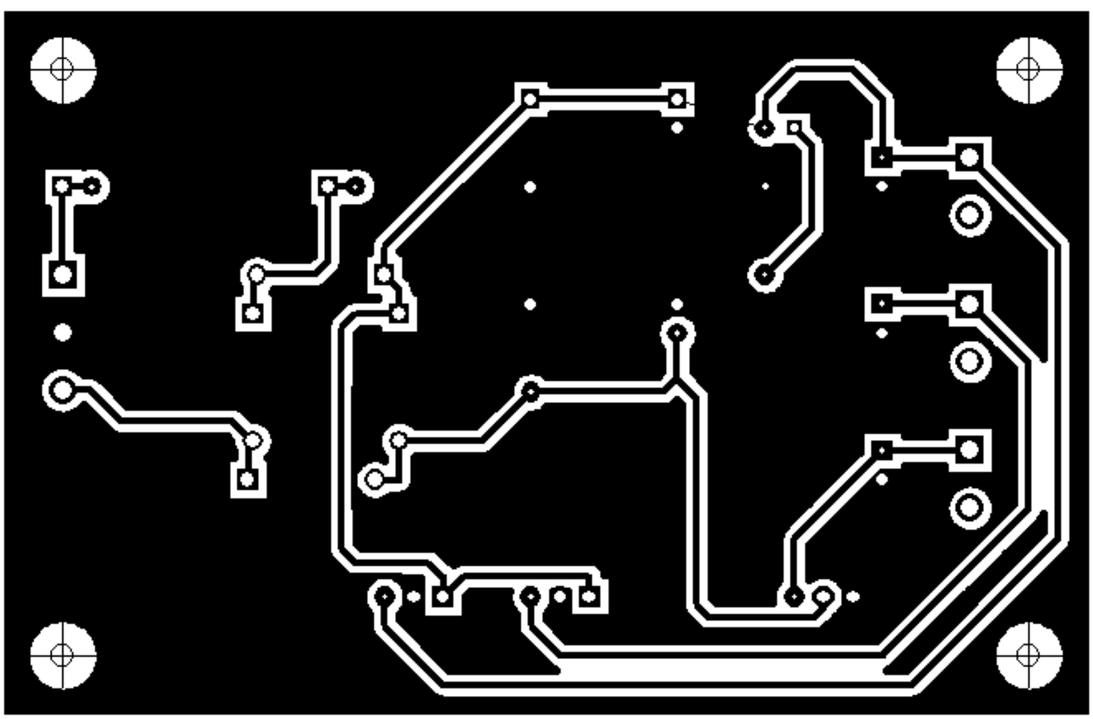


ALL LAYERS:

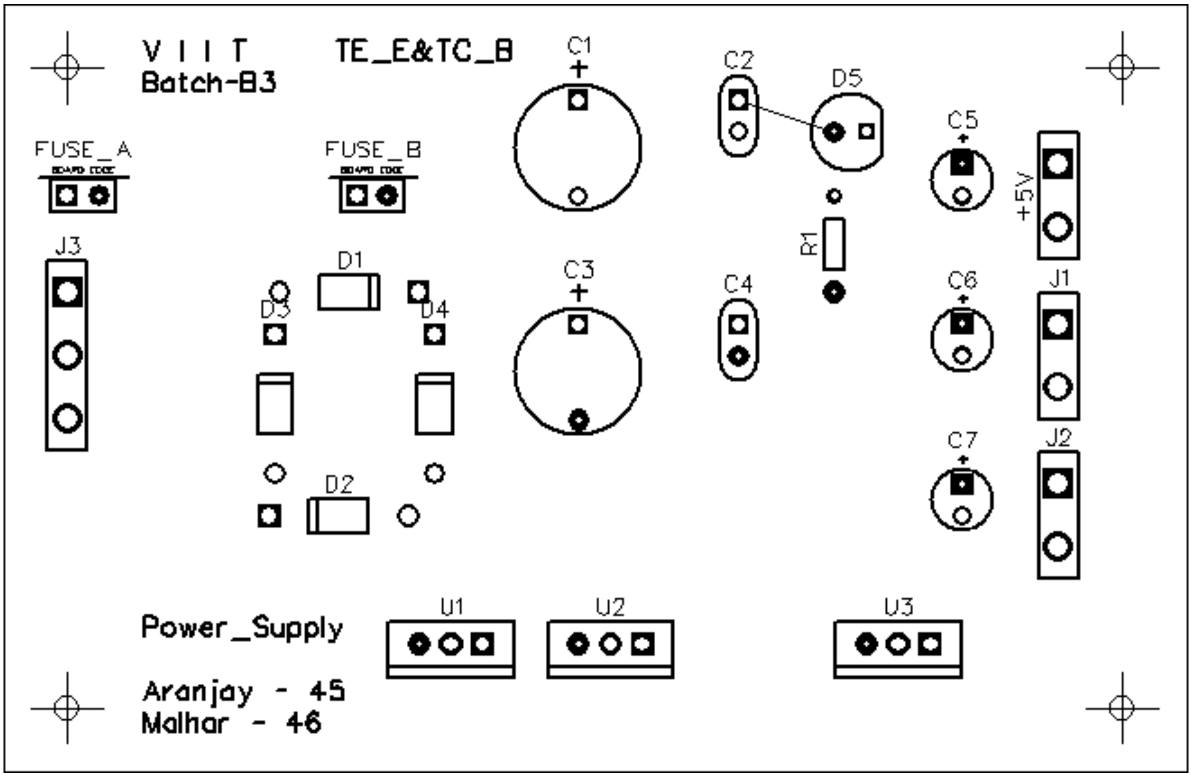


2. **POWER SUPPLY**

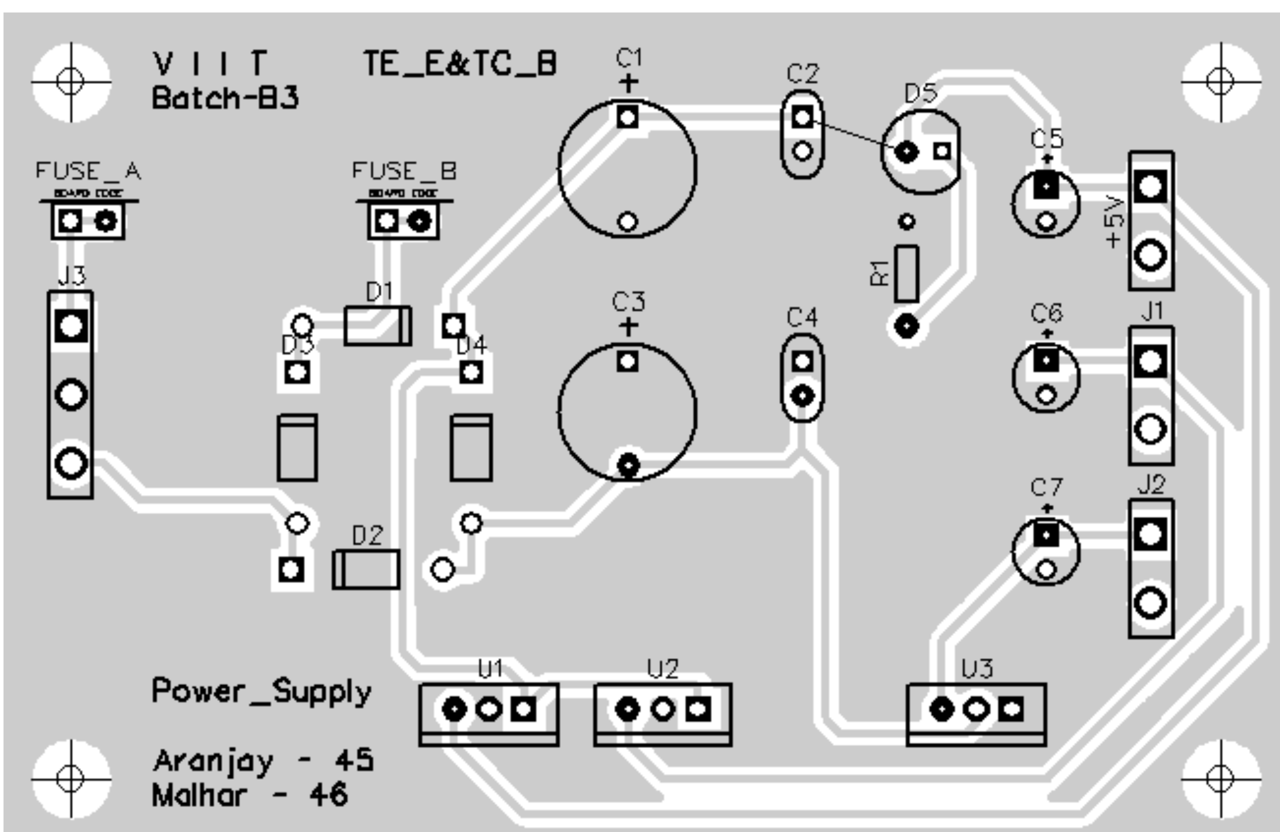
- **BOTTOM LAYER:**



TOP LAYER:

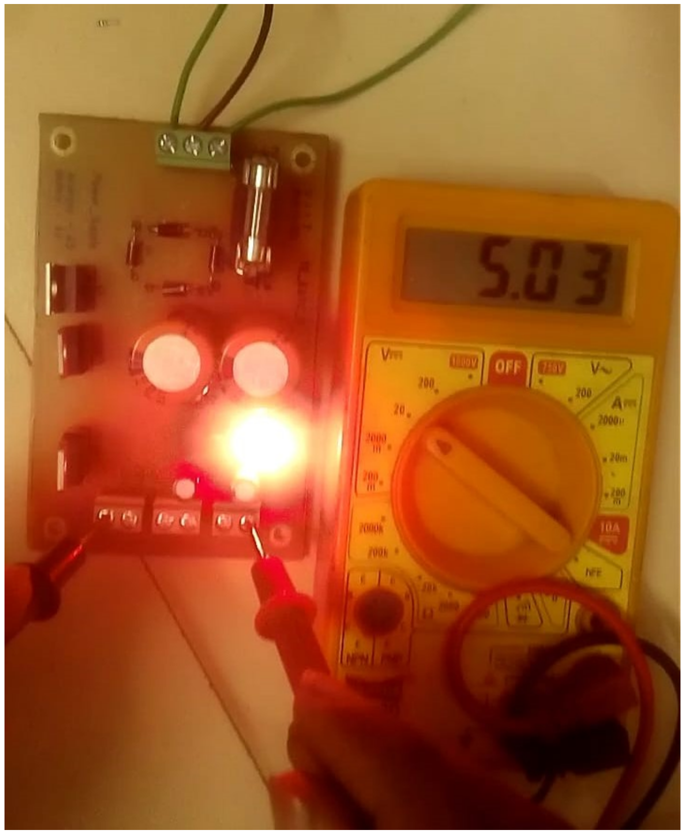


ALL LAYERS:

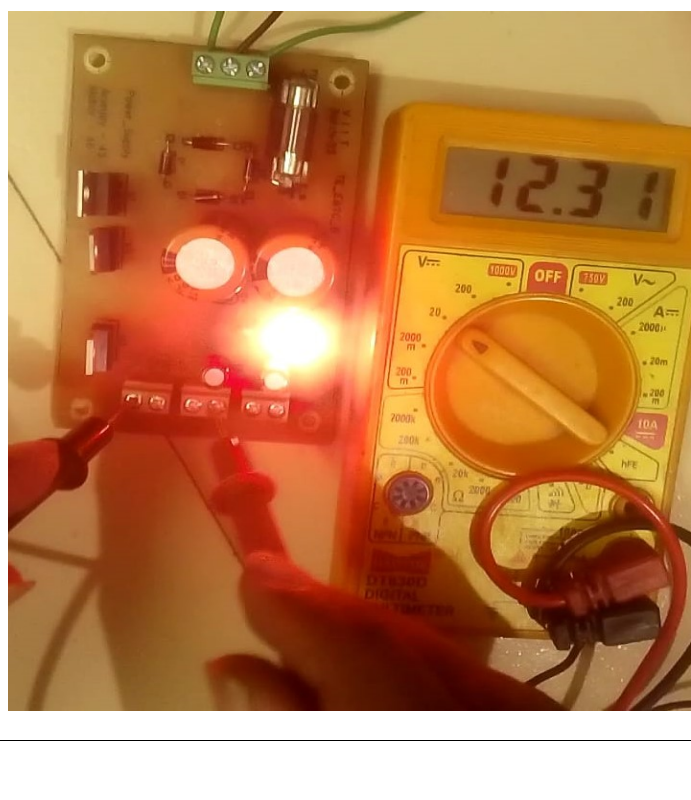


TESTING OF MODULES

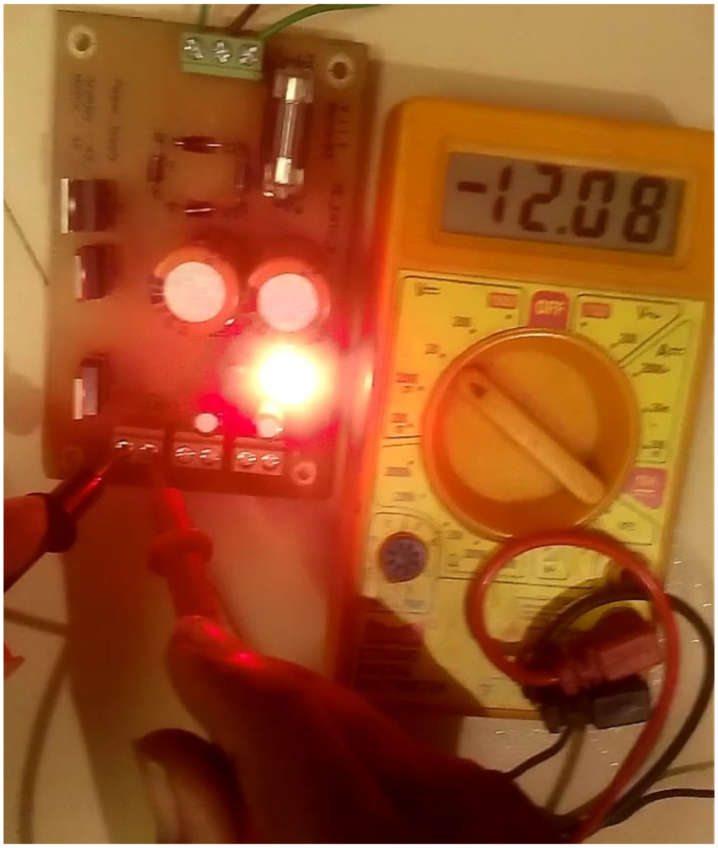
- **POWER SUPPLY TESTING:-**
  1) **5V SUPPLY:**



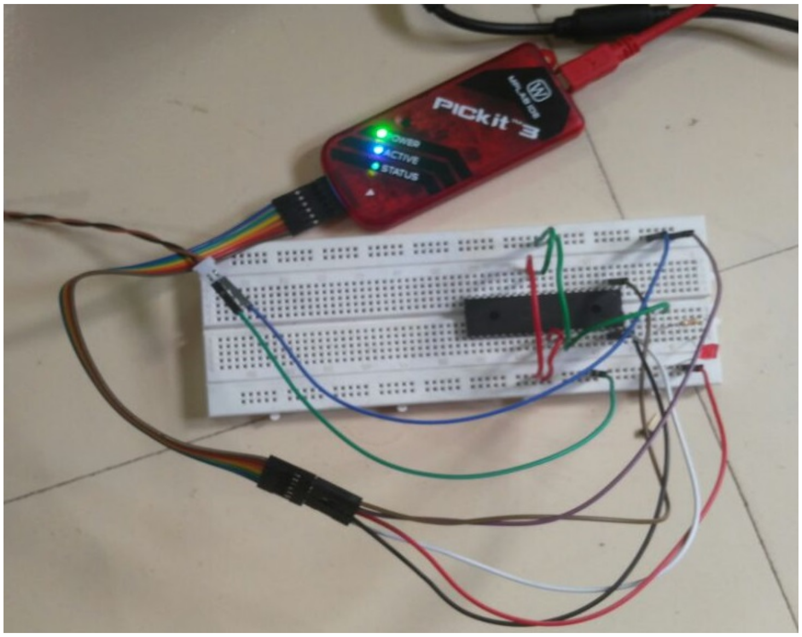
  2) **12V SUPPLY:**



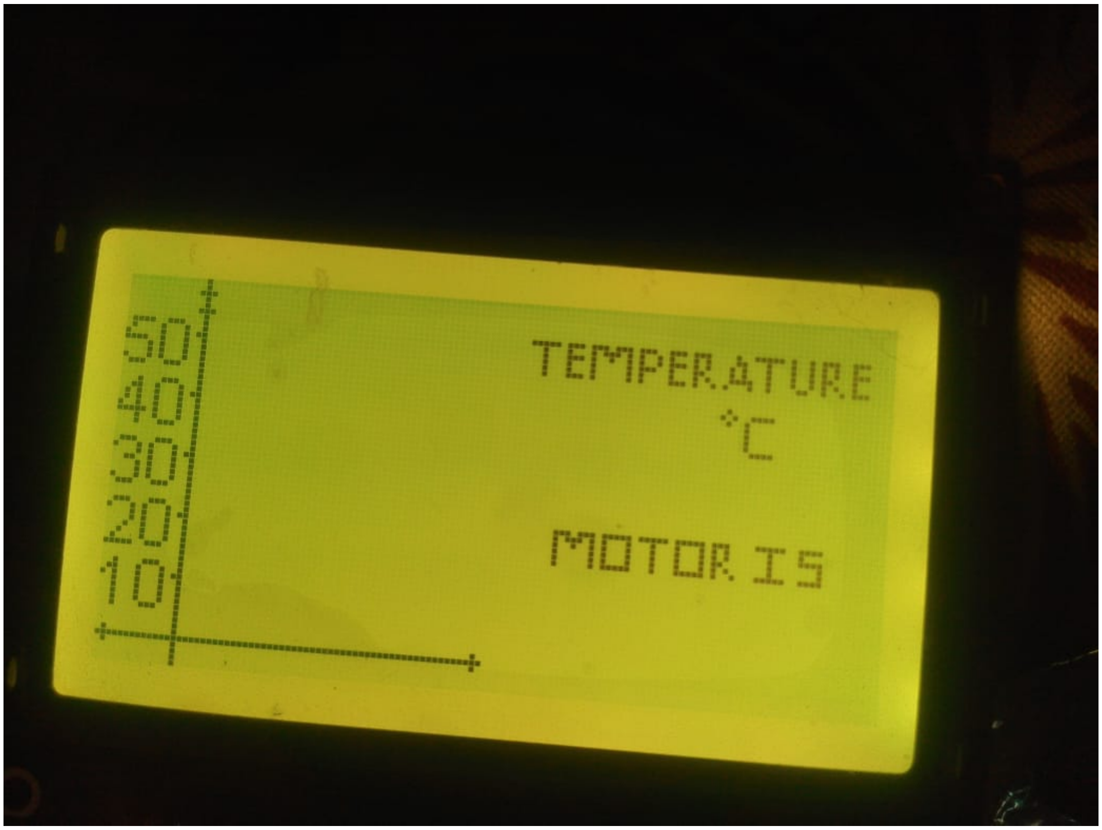
3) -12V SUPPLY:



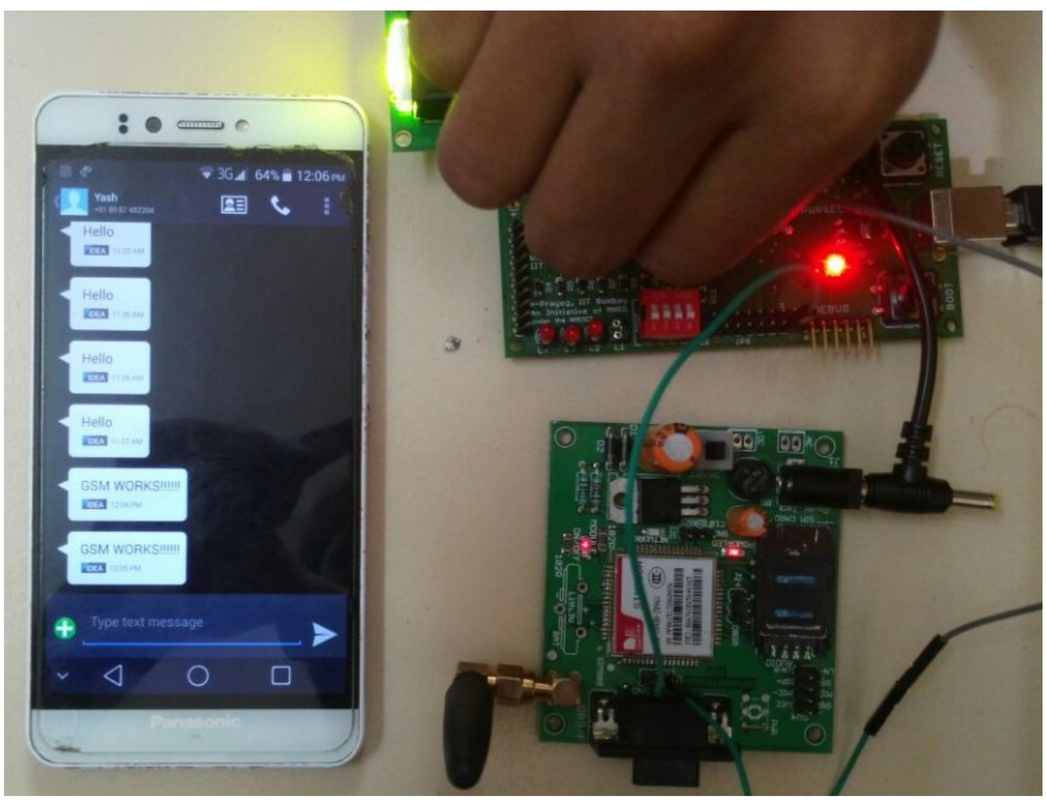
- **DEBUGING:**



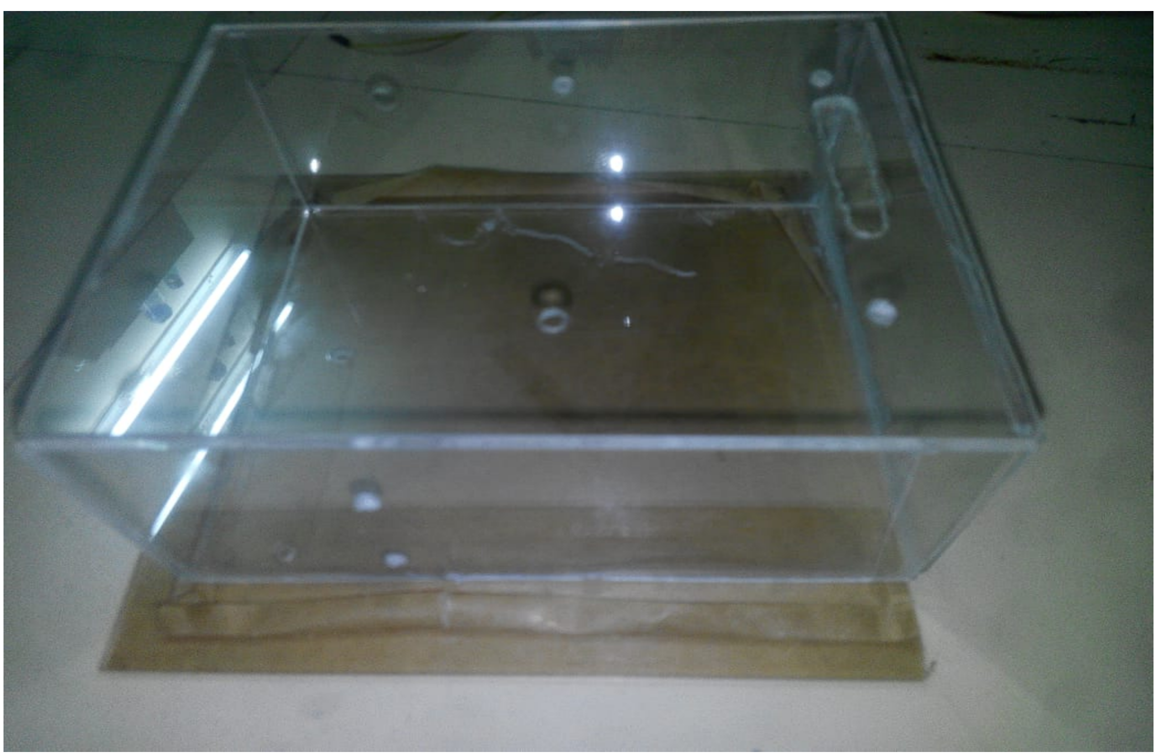
- **GLCD TESTING**



- **GSM TESTING**



CABINET DESIGN AND ASSEMBLY



BILL OF MATERIALS

Sr.No.	Components	Quantity	Price
1	PIC18f4550	1	270
2	Dc motor	1	20
3	Buzzer	1	10
4	relay	2	24
5	ULN2003	1	15
6	Crystal(20MHz)	1	03
7	SIM900	1	950
8	GLCD	1	650
9	Transformer (15v)	1	250
			Total = 2192

REFERENCES

A) Muhammad Ali Mazidi, Rolin D McKilany, Danny causey PIC Microcontroller and embedded systems. 2008.ISBN: 0-13-600902-6

B) Ramakant Gayakwad, Operational Amplifiers Linear Integrated Circuits, Prentice Hall of India, 3rd Edition

C) SENSORS- The Journal of Applied Sensing Technology, Advanstar Communications Inc

D) http://www.ijareeie.com/upload/2014/february/23_Greenhouse.pdf

E) http://www.electronicwings.com/pic/glcd-128x64-interfacing-with-pic18f4550-microcontroller

PROJECT PHOTOS

CONCLUSION

By working on this project we have learnt how to make a PCB. Everything from how to build the decided circuit's schematic on Altium to making of the PCB layout to comparing the above mentioned to purchasing and soldering of components according to the PCB layout. Also came to know about the software aspects by working on platforms like Proteus, Mplab etc and how to code for a specific microcontroller. And also about the differences between simulation and actual implementation on the hardware

DATASHEETS