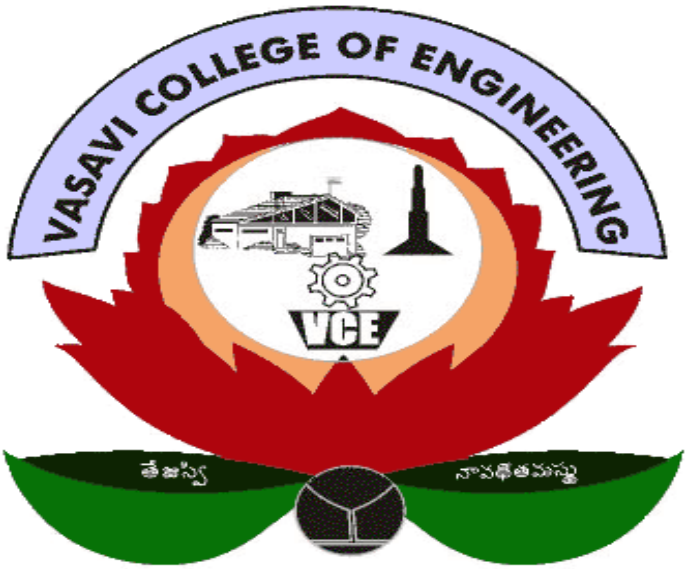
VASAVI COLLEGE OF ENGINEERING

ELECTRONIC DEVICES

MINIPROJECT REPORT

5V,1A REGULATED POWER SUPPLY (CHARGER)

ECE-B **II/IV** **III Semester**



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INTRODUCTION, AIM AND GLIMPSE OF PROJECT:

The main aim of this project is to make a DC regulated power supply of constant voltage 5V, 1A current from 230 v AC supply.

A regulated power supply is a device that maintains a constant output voltage regardless of changes in the input voltage or load current. In this project, we will be designing a 5V, 1A regulated power supply using a full wave rectifier and a pi section filter without an IC regulator. There are several ways to design a regulated power supply without using an IC regulator, one of which is using a zener diode in conjunction with a transformer and a rectifier.

The circuit diagram for a 5V, 1A regulated power supply using a zener diode would consist of the following components:

COMPONENT SPECIFICATIONS:

- **CENTER TAPPED TRANSFORMER 12-0-12 (3A)**
- **1N4007 -2NO.**
- **5OHMS 5WATTS PORCELLIN RESISTOR -2NO.**
- **5V ZENER**
- **470µF(400V) -2NO.**
- **300Mh**
- **PCB**
- **Power cord**

STEPS FOLLOWED:-

1)A transformer to step down the input voltage to a suitable level for the zener diode

2)A full-wave rectifier to convert the AC input voltage to DC

3)A filter capacitor to smooth out the ripple voltage(PI section filter is used)

4)A zener diode to regulate the output voltage

5)A load resistor to represent the load on the power supply

6)A resistor to limit the current flowing through the zener diode

7)The output voltage can be adjusted by changing the zener diode voltage rating, which can be calculated by adding the desired output voltage to the voltage drop across the load resistor.

Note:- Before implementing the design with hardware component, first testing must done in MULTISIM in order to know the specifications and required components of the design.

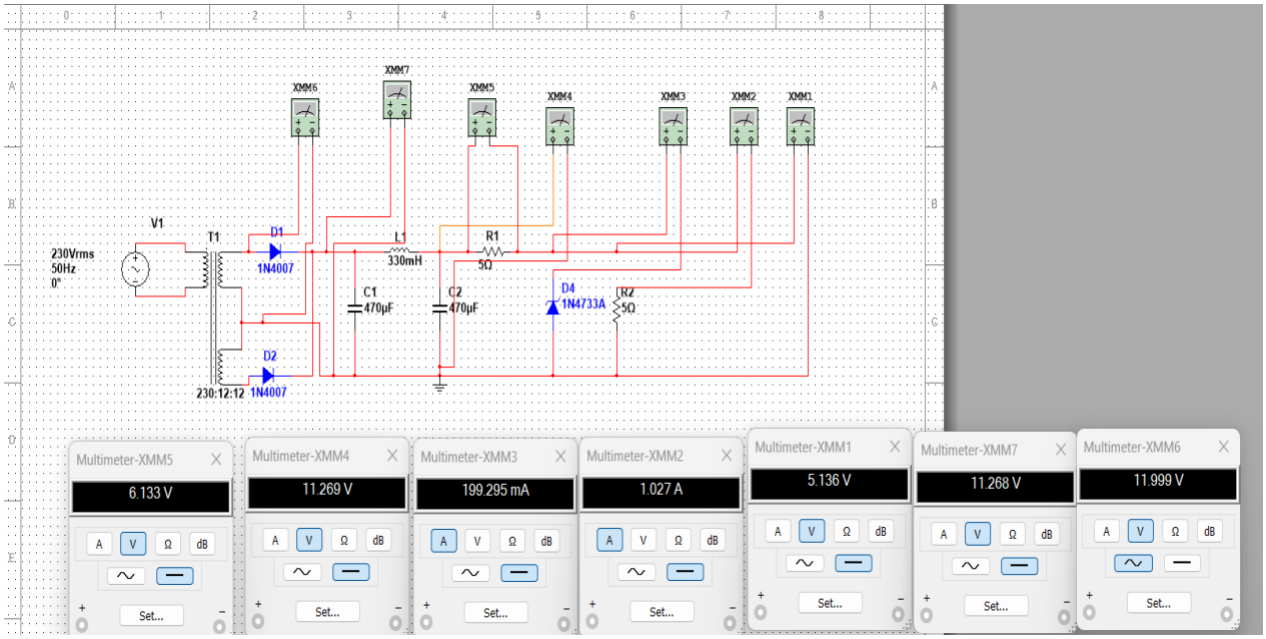
CIRCUIT DIAGRAM

We have tested the above circuit in multisim and then we have designed the same on groove board with the required components for further verification.

Later we built the same circuit on PCB by adding a plug cord and obtained the output with required specifications.

It is important to note that a Zener diode based regulator is not the most efficient way of creating a regulated power supply and are not suitable

for high current application.



DETAILED EXPLAINATION:

Since, the required output voltage is 5V, we have used centre tapped transformer

(230V:12:12).

- FULL WAVE RECTIFIER:

  The full wave rectifier circuit converts the AC input voltage to a DC voltage by allowing current to flow through the diode in only one direction. This eliminates the negative half cycles of the input voltage and provides a smooth DC output voltage.

- PI SECTION FILTER:

  The pi section filter circuit is used to smooth out the ripple voltage present in the DC output of the rectifier circuit. It is composed of two

capacitors and a resistor. The capacitors store charge and release it to the load as the voltage drops, while the resistor limits the amount of current flowing through the circuit.

Ripple factor of PI section filter is given by RF=3300/(C^2*RL*L);

As 330mH inductors are abundantly available, we preferred it. Substituting ripple factor as 0.01 and Load resistance as 5 ohms and inductance as 330 mH, we get C=470uF.

- Voltage divider circuit:

A voltage divider circuit is used to provide feedback to the control circuit for maintaining a constant voltage output. It is composed of two resistors connected in series. The voltage across the resistors is divided according to the ratio of their resistance values, and this divided voltage is used as a reference for the control circuit.

As we opted for 12V transformer which is equal to Vrms ,we obtain maximum voltage when it is converted to DC i.e, Vm=Vrms*sqrt(2), i.e 12*1.414=16.9V

- After the voltage drop across the PI section filter the remaining voltage will be in between 11.5V and 12V. As the 5v Zener diode should be in breakdown, remaining (6.5 to7) V must be dropped across the remaining part before the zener diode. So the current will be V/R= 1.3 to 1.4Amp. So if we connect Load resistance as 5ohms parallel to zener diode, then current across load will be Vz/RL = 5v/5ohm= 1amp. Remaining 0.4 Amp flows through Zener, so the diode will be still in break down only.

APPLICATIONS:

The main function of this is to supply a constant voltage to a circuit that should be functioned in a particular power supply limit.

- Mobile phone chargers
- Regulated power supplies in different appliances
- Various oscillators & amplifiers

CONCLUSION:

The 5V, 1A regulated power supply designed using a full wave rectifier and a pi section filter without an IC regulator is a simple and cost-effective solution for providing a constant voltage output. The circuit is easy to build and can be used for a wide range of applications. The use of voltage divider circuit, safety features and proper selection of component values will help in achieving the desired voltage and current output.