

SCHOOL OF ELECTRONICS ENGINEERING
Program :Electronics and Communication

Analog Electronic Circuits laboratory Course code: 15EECP202

EXPERIMENT NO. : Open Ended Experiment

Title of the Experiment: Regulated Power Supply

Aim or Objective: To design a regulated power supply for the given specifications

Specifications: Transformer - Yes

Output Voltage - +5V,-5V,+12Vand-12V

Out Put Current - 2A

Short Circuit Protection - Yes

List of Component / Equipment:

Sl. No	C o m p o n e n t / Equipment	Specification	Quantity
1	Transformer	12 0 12	01
2	Diodes	IN 4007	4
3	Capacitors	2200 micro F	1
4	12V Regulator	7812 IC	1
5	5V Regulator	7805 IC	1
6	PCB		1

Theoretical background:

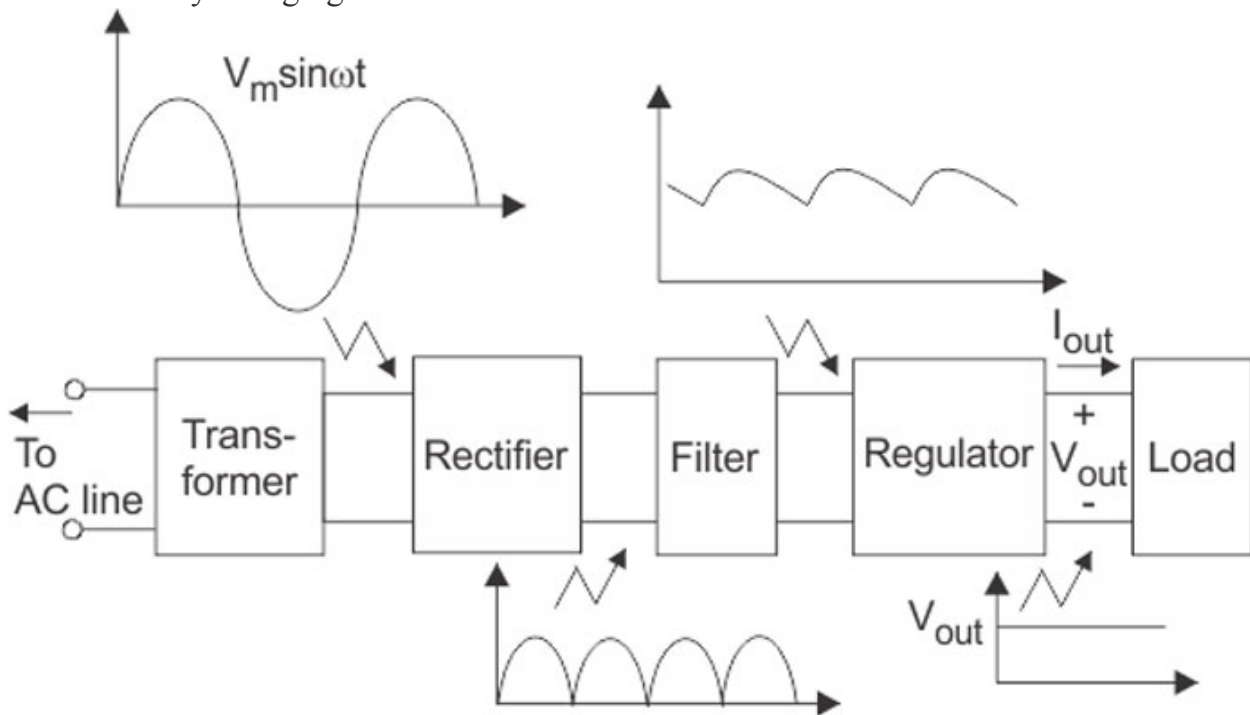
The regulated power supply is an embedded circuit. Converts unstabilized alternating current (alternating current) to constant direct current. With the help of a rectifier, it converts alternating current to direct current. Its function is to provide a stable voltage (or rarely current) to circuits or devices that need to operate within certain power limits. It provides constant voltage irrespective of the variations in input voltage.

SCHOOL OF ELECTRONICS ENGINEERING
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Transformer:

A step down transformer is used to step down the voltage from the input AC to the required voltage of the electronic device. This output voltage of the transformer is customized by changing the turn's



Components of typical linear power supply

ratio of the transformer according to the electronic device specs. The input of the transformer being 230 Volts AC mains, the output is provided to a full bridge rectifier circuit.

Full Wave Rectifier Circuit:

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Analog El

The FWR consists of 4 diodes which rectify the output AC voltage or current from the transistor to its equivalent DC quantity. As the name implies the FWR rectifies both half's of the AC input. The rectified DC output is given as input to the filter circuit.

Filter Circuit:

The filter circuit is used to convert the high rippled DC output of the FWR to ripple free DC content. A Π filter is used to make the waveforms ripple free.

Regulator:

After the current is passed through filters there are still some variations in the voltage to overcome this voltage regulators are used to provide desired constant voltages. At the end a constant voltage is obtained. A regulator is the linear integrated circuit use to provide a regulated constant output voltage.

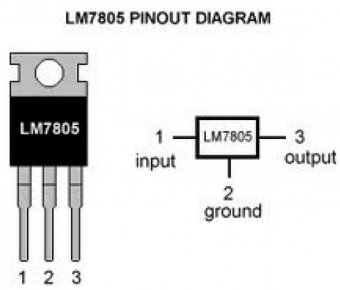
Design:

Regulator:

The selection of a regulator IC depends on your output voltage. In our case, we are designing for the 5V output voltage; we will select the LM7805 linear regulator IC, and for the 12V output voltage we need LM7812 linear regulator IC.

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Analog Electronic Circuits laboratory Course code: 15EECP202



From the data sheets the power, voltage and current readings of the following IC are

For LM7805

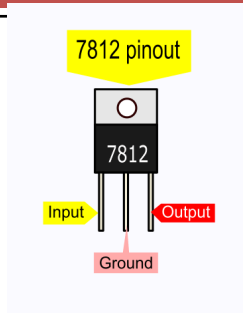
Input voltage: 7- 35V

Output voltage 4.8-5.2V

Current – 1-1.5A

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Program :Electronics and Communication

Analog Electronic Circuits laboratory Course code: 15EECP202



For LM7812

Input voltage: 19- 35V

Output voltage 11.5-12.4V

Current – 1-1.5A

Transformer:

It turns out that the minimum input to the selected regulator IC is 7V. Therefore, a transformer is needed to reduce the main alternating current to at least this value. There is also a diode bridge rectifier between the controller and the transformer. Rectifiers have their own voltage drop of 1.4V.

$$V_{\text{secondary}} = 7 + 1.4 = 8.4\text{V}$$

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This means we should select the transformer with a secondary voltage value equal to 9V or at least 10% more than 9V. From this we need a transformer of at least 1.5 A and secondary voltage of 12V. we choose 12012 transformer.

Rectifier:

Rectifier is made up of four diodes either we can use 4 diodes and connect them in bridges or we can directly connect individual bridge. We connected 4 diodes in bridge and made a rectifier.

We select IN4007 diode because it has the current rating of 1.5A and peak reverse voltage of 50V.

Capacitor:

Voltage, power ratings, and capacitance values need to be considered when choosing the right capacitor filter. Nominal voltage is calculated from the secondary voltage of the transformer. As a rule of thumb, the nominal voltage of a capacitor should be at least 20% higher than the secondary voltage. Next, you need to calculate the correct capacity value.

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Program :Electronics and Communication

Analog Electronic Circuits laboratory Course code: 15EECP202

It depends on the output voltage and output current. To find the correct capacitance value, use the following equation:

$$C = I_0 / 2\pi f V_0 \quad \text{where,}$$

I_0 = load current, that is,

V_0 = output voltage, that is

f = frequency

In our case:

$$C = 2200 \text{ micro F}$$

The suitable capacitor will be 2200microF

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Step by step procedure to carry out experiment:

1. Circuit is rigged up as shown in the figure with all the components.
2. The input is given to the transformer
3. Output is checked at the regulators

Table of observations:

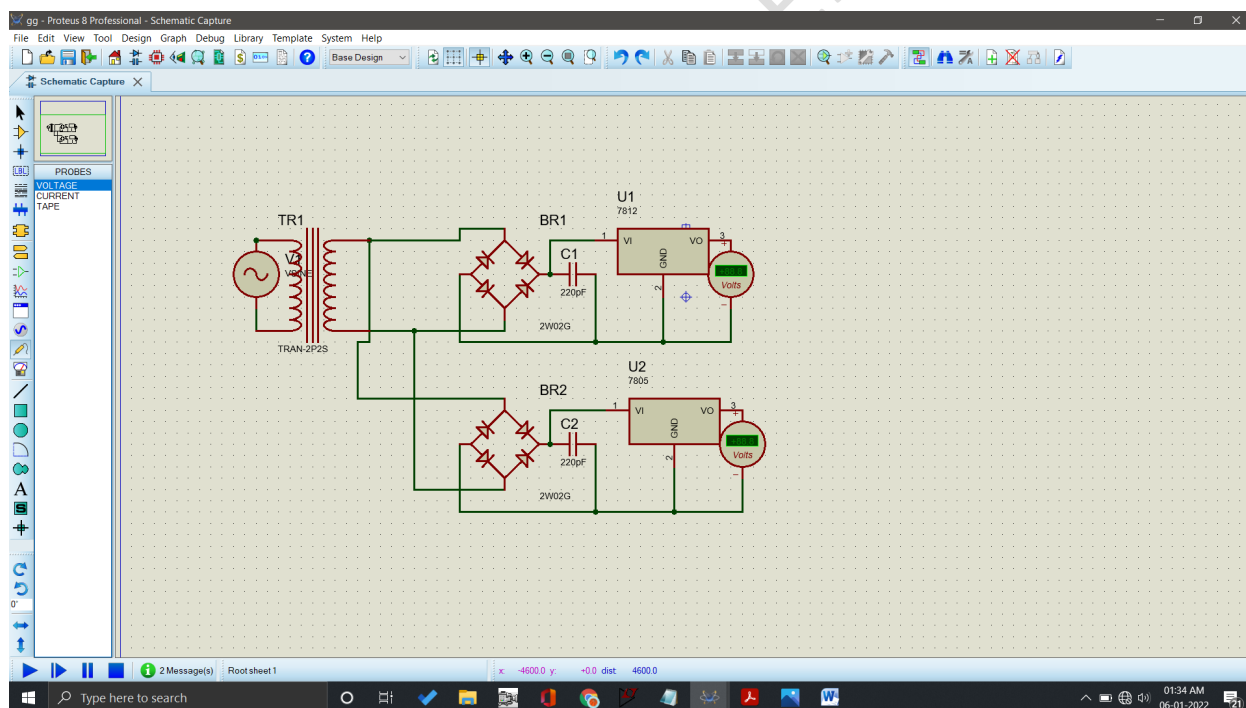
Output Voltage	Output Current
+5V,-5V	2A
+12V,+12V	2A

Results& Discussion:

Results are verified experimentally.

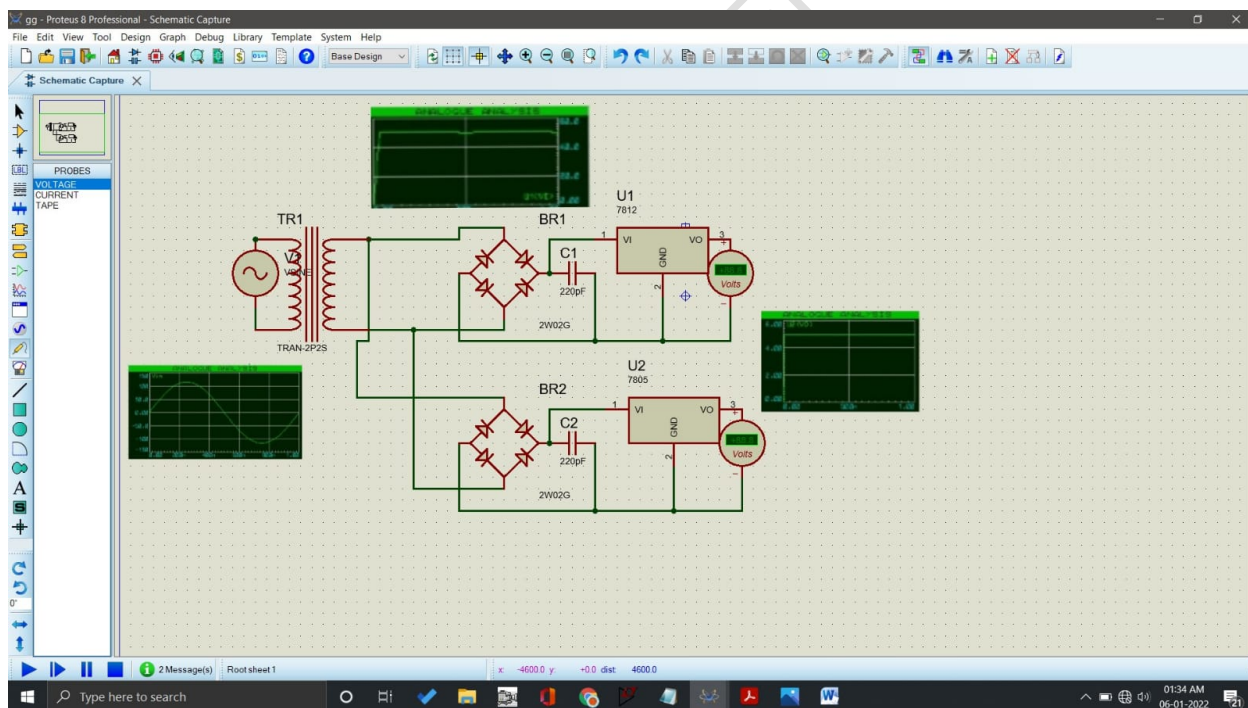
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Analog Electronic Circuits laboratory Course code: 15EECP202



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Analog Electronic Circuits laboratory Course code: 15EECP202

Regulated power supply is realized and the following observation are drawn

1. With AC as input +12V is observed at IC7812
2. With AC as input +5V is observed at IC7805
3. With AC as input -12V is observed at IC7812 by inversing terminals
4. With AC as input -5V is observed at IC7805 by inversing terminals

Conclusion:

We designed and implemented regulated power supply with the given specifications.

We concluded that a regulated power supply changes unregulated alternating current to a stable direct current. It is also called liner power supply as it provides constant linear voltage supply.