



## Experiment No.: 2

### DC power supply

#### 1- Objective

The purpose of this circuit is for providing a constant dc output voltage for any changes in input voltage or load conditions.

#### 2- Circuit elements

- Ac power
- Transformer rated (step-down)
- Bridge diode
- Capacitor pol rated
- Capacitor
- Voltage regulator IC (LM7805)
- Oscilloscope
- Voltmeter

#### 3- Working Explanation

Before constructing the voltage regulator, we need to think about the circuit requirements for example **Input Supply ( $V_{in}$ )** available, Output Supply ( $V_{out}$ ) requirement, current output, thermal protection, etc., An illustration gives you a concept of the voltage regulator. We designed a **7805 IC** circuit diagram to give a fixed **5V DC** at the output, you can choose a different voltage rating IC (78XX) and corresponding input power source to get desired output voltage range. Initially, a **Step-down transformer** is taken and its primary is connected to the main supply and the secondary is connected to **Bridge rectifier**. The step-down transformer is used to reduce the AC supply voltage and then the Bridge rectifier module made up of diodes is used to convert AC into DC Supply. IC 7805 is connected according to the pin directions. The first important point to note is that the input voltage should always be greater than the output voltage. At the output filter capacitor is used to remove the distortions. When we apply supply to this circuit, we can obtain **regulated output (5) voltage** with constant load current. IC 7805 Comes in different package sizes and we can choose depending on our circuit requirements.

#### 4- Procedure

This experiment will be in several steps:

##### Step 1/ (Transformer)

- 1- Insert Ac power ( $V_{rms} = 120V$ ,  $F = 60Hz$ ).
- 2- Insert Transformer rated (step-down) and change the primary to secondary turns ratio to 10.
- 3- Insert two of the voltmeter to read the voltage on the side of the Ac power and transformer and the same thing with the Oscilloscope to show the waveform as shown in the figures below.

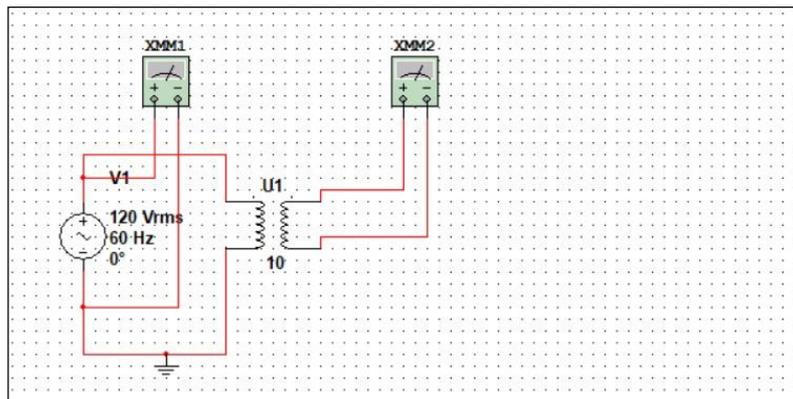


Fig.1: Step-down transformer side with voltmeter.

The first voltmeter will read 120v and the second one will read 12v. and then Insert the Oscilloscope and shows the output from both sides.

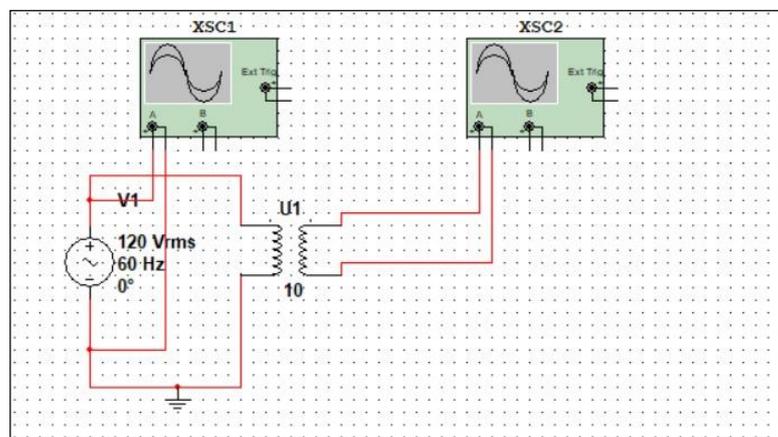


Fig.2: Step-down transformer side with oscilloscope.

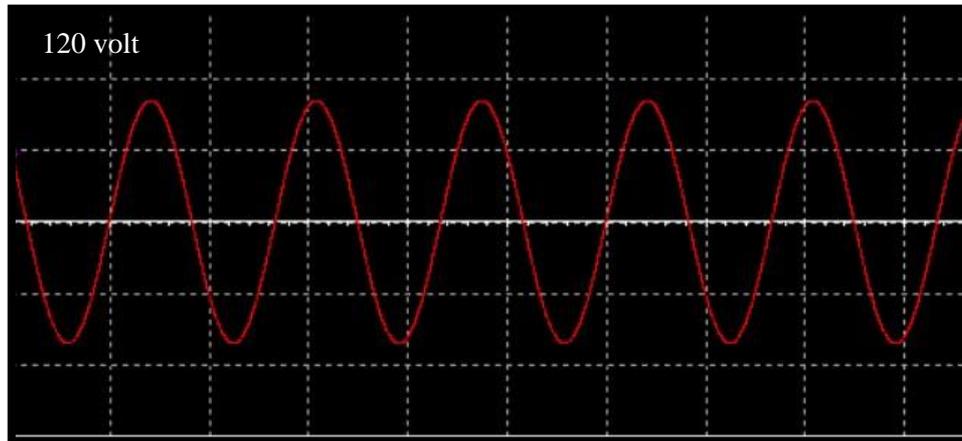


Fig.3: AC supply waveform.

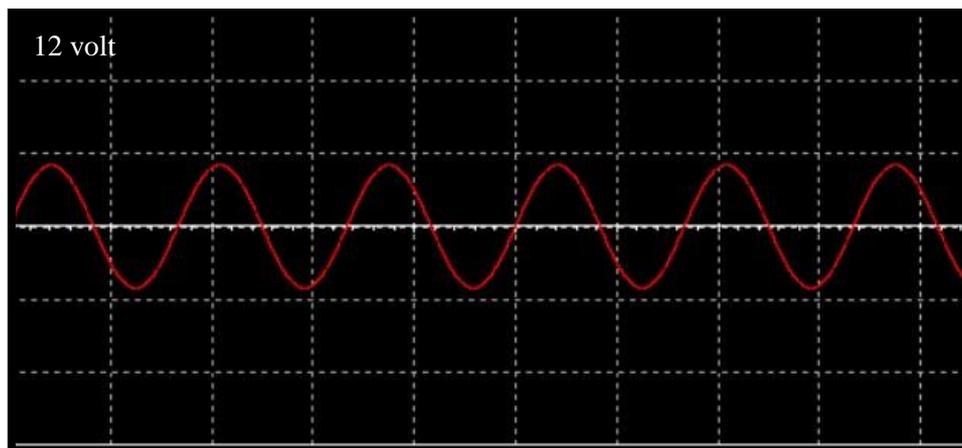


Fig.4: step-down transformer waveform.

In the first figure, we show that the first waveform is bigger than the second one because we have used a step-down transformer to reduce the input voltage from 120v to 12v.

#### Step 2/ (Rectifier)

Insert the bridge diode (1B4B42) to convert the ac voltage (alternating waveform) to dc voltage as shown in the figures below.

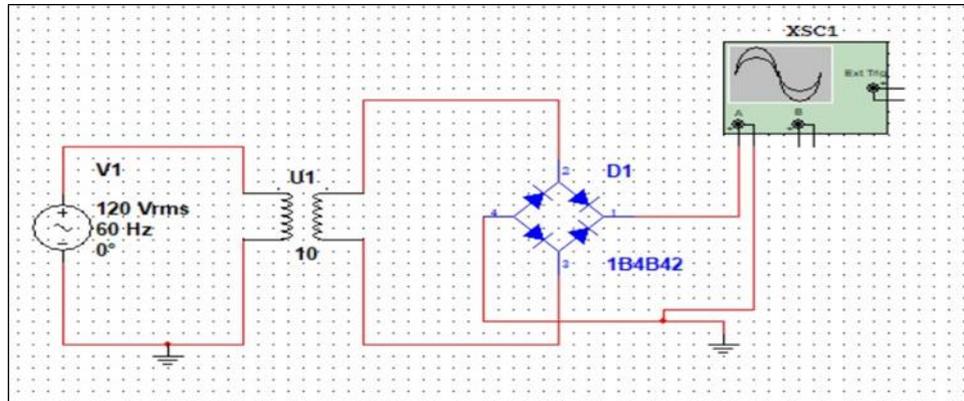


Fig.5: rectifier circuit.

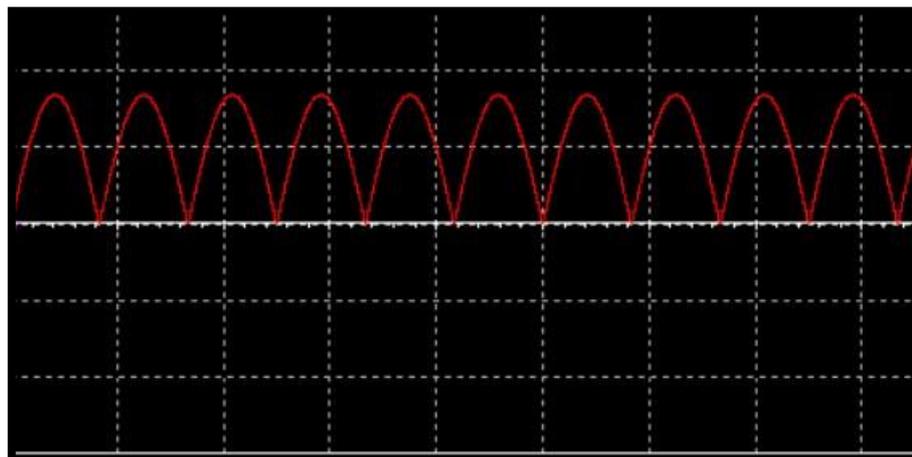


Fig.6: rectifier waveform.

The rectifier is a very important part of this circuit. It converts the AC voltage coming from the transformer output into DC voltage.

### Step 3/ (Filter)

1- Insert a Capacitor pol rated (1 micro-farad) because the rectifier circuit's output is not pure. The rectifier's output DC supply contains some AC components known as ripple. As a result, a filter circuit is necessary to convert impure DC to pure DC. A pure capacitor filter is utilized as shown in the figure below.

2- Insert the Oscilloscope to show the output from the filter.

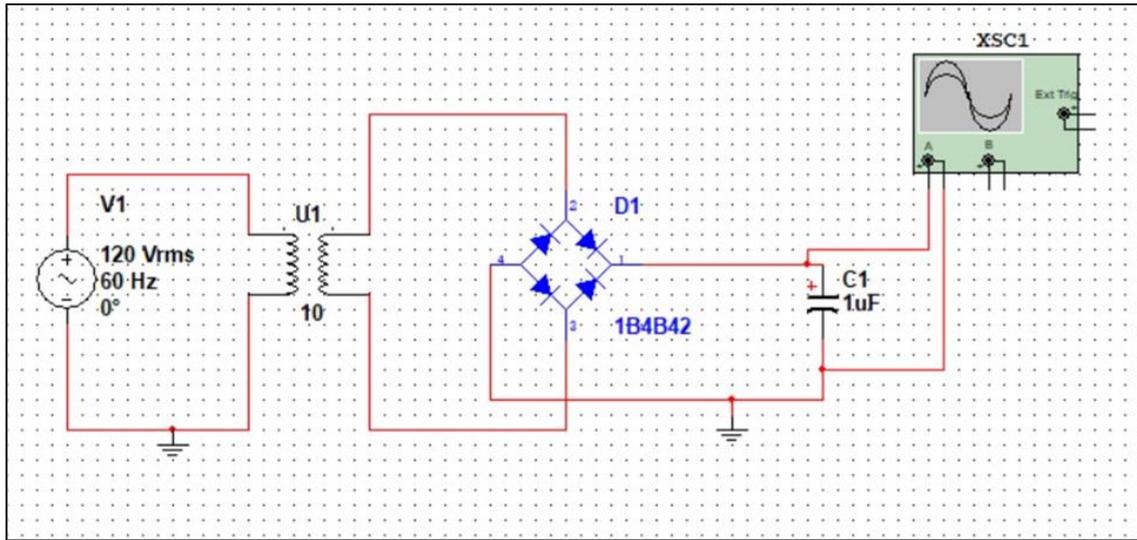


Fig.7: Filter circuit.

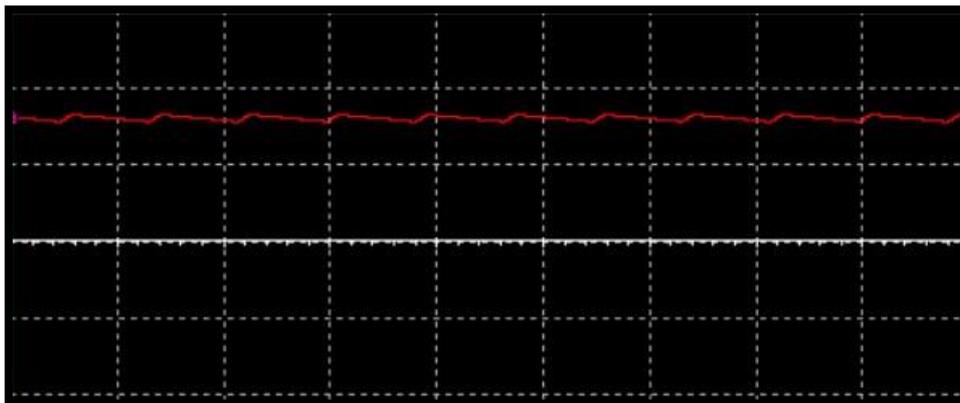


Fig.8: Ac component (ripples) waveform.

Step 4/ (Voltage regulator IC)

- 1- Insert the IC input capacitor (10 micro-farad)
- 2- Insert IC (LM7805)
- 3- Insert the IC output capacitor (10 micro-farad)
- 4- Insert the Oscilloscope and voltmeter to show the DC output with a voltage equal to 5v as shown in the figure below.

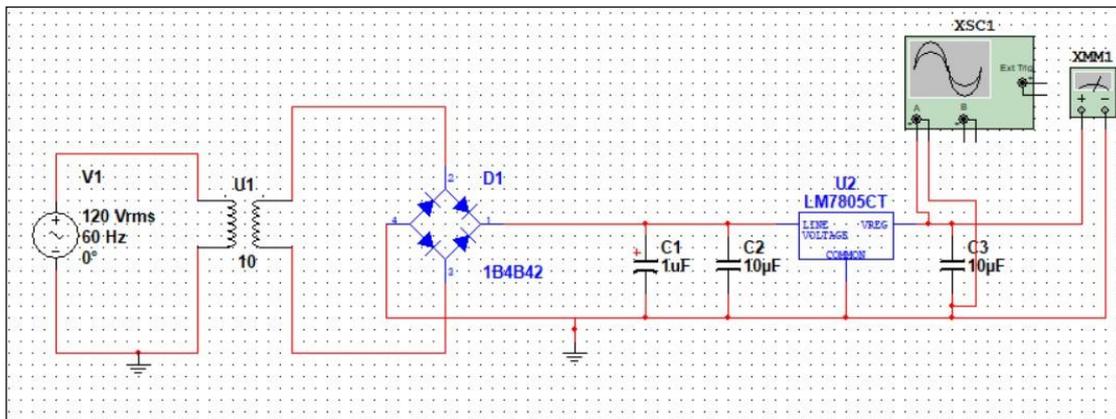


Fig.9: Dc power supply circuit.

The voltmeter will read a 5v and the dc output voltage as shown in the figure below.

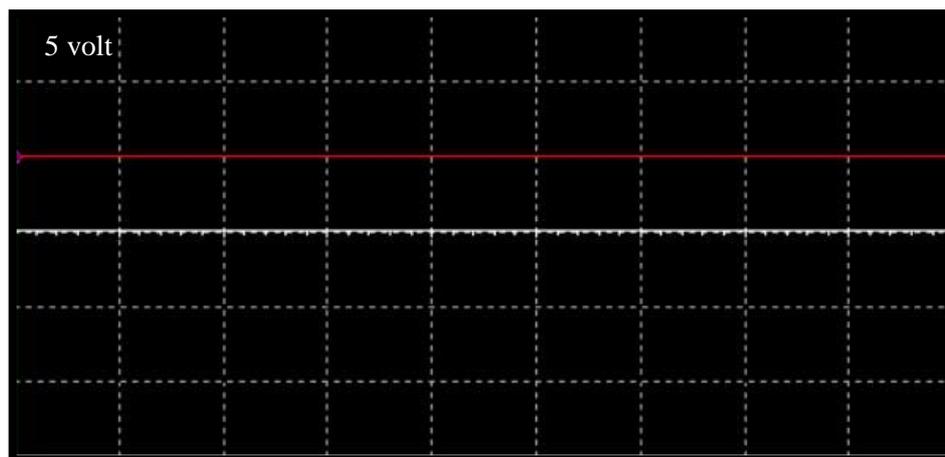


Fig.10: Dc output voltage.