Objective: To study about center tapped full wave rectifier with different types of filters, with and without regulation.

Materials Required:
Regulated DC Power Supply, Resistance(1KΩ), Capacitor(10μF), Diodes(IN4007), Connecting wires.

Theory:
The conversion of AC current waveform into DC current wave form is called rectification. A rectifier is an electrical device that do such a conversion, it is commonly made of solid state diodes. Rectifiers have many applications such as components of power supply and as envelope detectors of radio waves etc.

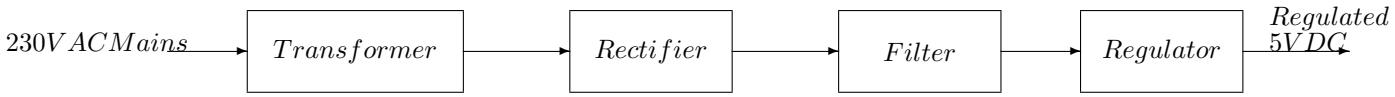

Figure 1: A Block diagram of regulated power supply

Full Wave Rectifier:
A full-wave rectifier converts both the positive and negative halves of the AC input waveform into a single polarity at its output. For a full wave rectifier the DC voltage, V_{dc} and Root mean squared(rms) voltage, V_{rms} are related to the peak voltage, V_m as:

$$\begin{aligned} V_{dc} &= \frac{2V_m}{\pi} \\ V_{rms} &= \frac{V_m}{\sqrt{2}} \\ V_{ac} &= \sqrt{V_{rms}^2 - V_{dc}^2} \end{aligned} \tag{1}$$

The ripple factor, r can be found out using

$$r = \frac{V_{ac}}{V_{dc}} = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1} \tag{2}$$

It should be noted that the AC Voltmeters typically report the root-mean-square(rms) Voltage, V_{rms}.Therefore for the experimental measurement of ripple factor, the equation (2) can be used straightforwardly for any case(with or without filter).
Theoretical value of ripple factor(r) for the rectifier without filter can be found using equations(1).

$$r = \frac{V_{ac}}{V_{dc}} = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1} = \sqrt{\left(\frac{\frac{V_m}{\sqrt{2}}}{\frac{2V_m}{\pi}}\right)^2 - 1} = 0.48 \tag{3}$$

Filters:

1. L-section Filter

The theoretical value of ripple factor(r) for a L-section filter is given as:

$$r = \frac{R_L}{3\sqrt{2}\omega L} \tag{4}$$

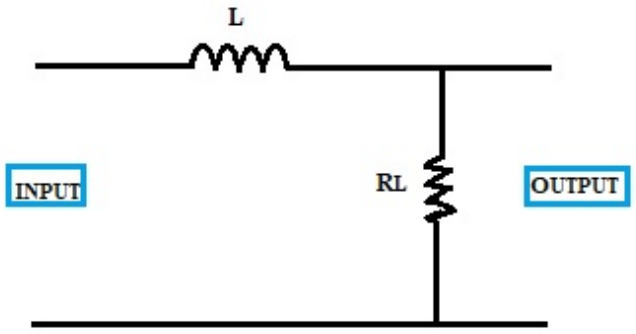

Figure 2: L-section filter.

2. LC Filter

The theoretical value of ripple factor(r) for a LC filter is given as:

$$r = \frac{1}{6\sqrt{2}\omega^2 LC} \tag{5}$$

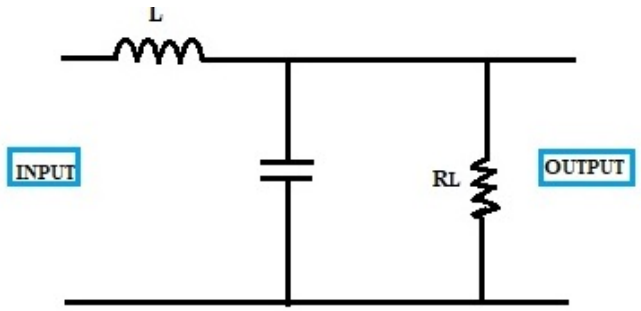

Figure 3: LC filter.

3. π section Filter

The theoretical value of ripple factor(r) for a π-section filter is given as:

$$r = \frac{\sqrt{2}}{8\omega^3 C_1 C_2 L R_L} \tag{6}$$

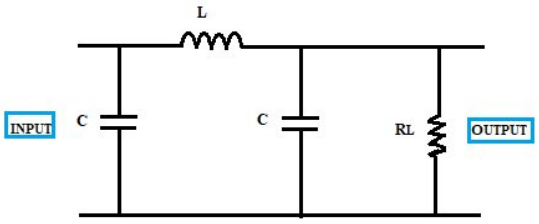

Figure 4: π-section filter.

Procedure:

Part A

1. Find out V_{dc} and V_{rms} experimentally and calculate the ripple factor for a center-tapped full wave rectifier without filter.
2. Repeat the above step for different types of filters namely, L-section, LC filter and π-section filter.
3. Compare the theoretical and experimental ripple factor value for each of the above-mentioned case.

Part B

1. Voltage regulation is the ability of a system to provide a constant voltage over a wide range of load conditions. Make connections for the voltage regulation circuit as per the circuit diagram.

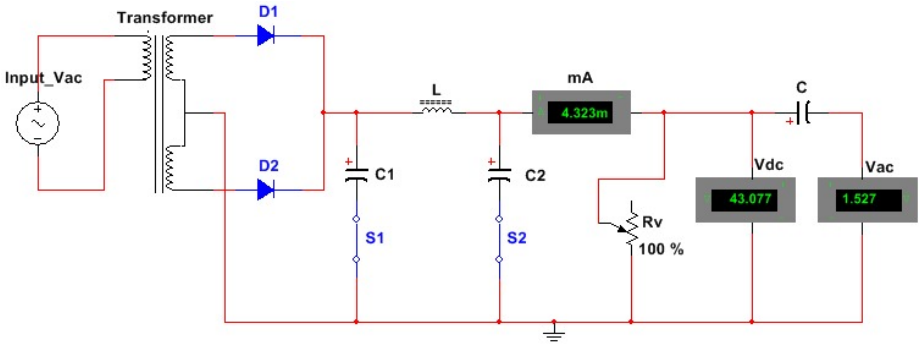

Figure 5:
Circuit Diagram for part A of the experiment using π-section filter.

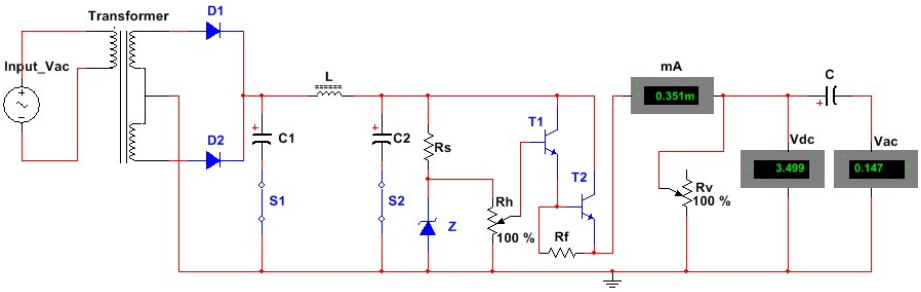

Figure 6: Circuit Diagram for part B of the experiment using π-section filter.

2. Find out V_{dc} and I_L by changing load resistance values for an unregulated supply.

3. Repeat the above step for the regulated supply.

Observation Table:

Table 1: Observation Table for Part A

Type of Filter	V_{rms}	V_{dc}	**Ripple factor** (Theoretical)	**Ripple factor** (Experimental)
1. Without Filter				
2. LC				
3. $\pi-$section				
4. L-section				

Table 2: Observation Table for Part B

Sr.no	Regulated Supply			Unregulated Supply		
	I_L	V_{dc}	V_{ac}	I_L	V_{dc}	V_{ac}