Experiment Number -04

PEC-101/201 Fundamental of Electronics Engineering Lab
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OBJECT

To study Half Wave and Full Wave Rectifier Circuits

APPRATUS REQUIRED

1. Half Wave and Full Wave Rectifier Kit.
2. Connecting Probes (Leads), CRO Connecting Probe.
3. Cathode Ray Oscilloscope (CRO)
4. Power Supply

THEORY

Half Wave Rectifier

The Half wave rectifier is a circuit, which converts an alternating voltage to direct voltage.

In the Half wave rectifier circuit shown the transformer serves two purposes.

1. It can be used to obtain the desired level of dc voltage (using step up or step down transformers).
2. It provides isolation from the power line.

The primary of the transformer is connected to ac supply. This induces an alternating voltage across the secondary of the transformer.

- During the positive half cycle of the input voltage the polarity of the voltage across the secondary forward biases the diode. As a result a current I_L flows through the load resistor, R_L. The forward biased diode offers a very low resistance and hence the voltage drop across it is very small. Thus the voltage appearing across the load is practically the same as the input voltage at every instant.
- During the negative half cycle of the input voltage the polarity of the secondary voltage gets reversed. As a result, the diode is reverse biased. Practically no current flows through the circuit and almost no voltage is developed across the resistor. All input

voltage appears across the diode itself. Hence we conclude that when the input voltage is going through its positive half cycle, output voltage is almost the same as the input voltage and during the negative half cycle no voltage is available across the load.

This explains the unidirectional pulsating dc waveform obtained as output. The process of removing one half the input signal to establish a dc level is aptly called half wave rectification.

Full Wave Rectifier

Centre Tapped Transformer

A Full Wave Rectifier is a circuit, which converts an alternating voltage into a pulsating direct voltage using both half cycles of the applied alternating voltage.

It uses two diodes of which one conducts during one half cycle while the other conducts during the other half cycle of the applied alternating voltage

- During the positive half cycle of the input voltage, diode D1 becomes forward biased and D2 becomes reverse biased. Hence D1 conducts and D2 remains OFF. The load current flows through D1 and the voltage drop across R_L will be equal to the input voltage.
- During the negative half cycle of the input voltage, diode D1 becomes reverse biased and D2 becomes forward biased. Hence D1 remains During the negative half cycle of the input voltage, diode D1 becomes reverse biased and D2 becomes forward biased. Hence D1 remains

Bridge Rectifier

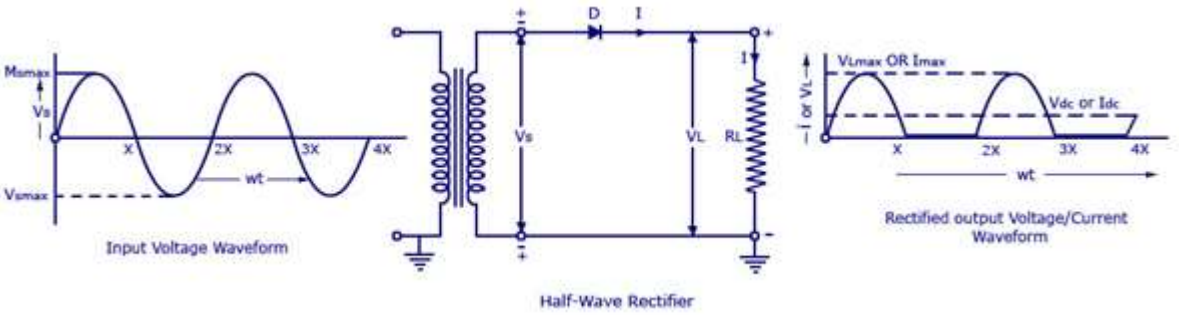
Another type of circuit that produces the same output waveform as the full wave rectifier circuit above, is that of the Full Wave Bridge Rectifier. This type of single phase rectifier uses four individual rectifying diodes connected in a closed loop “bridge” configuration to produce the desired output. The main advantage of this bridge circuit is that it does not require a special centre tapped transformer, thereby reducing its size and cost. The single secondary winding is connected to one side of the diode bridge network and the load to the other side as shown in the figure.

- The four diodes labelled D1 to D4 are arranged in “series pairs” with only two diodes conducting current during each half cycle.
- During the positive half cycle of the supply, diodes D1 and D3 conduct in series while diodes D2 and D4 are reverse biased and the current flows through the load as shown below.

- During the negative half cycle of the supply, diodes D2 and D4 conduct in series, but diodes D1 and D3 switch “OFF” as they are now reverse biased. The current flowing through the load is the same direction as before.

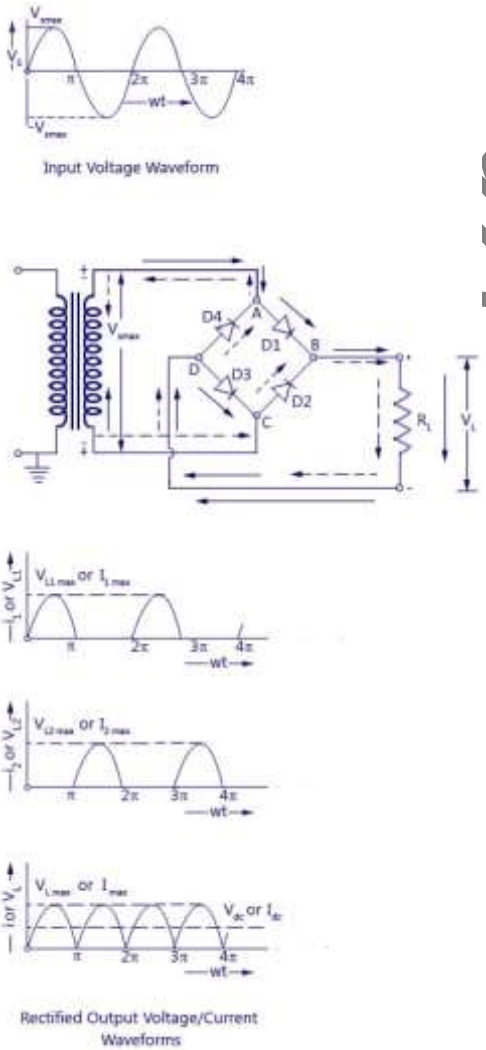
CIRCUIT DIAGRAM

Half Wave Rectifier

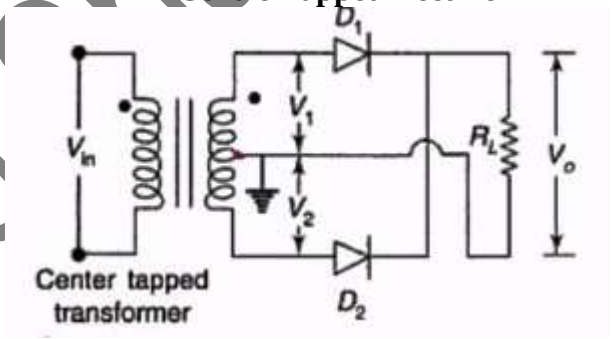


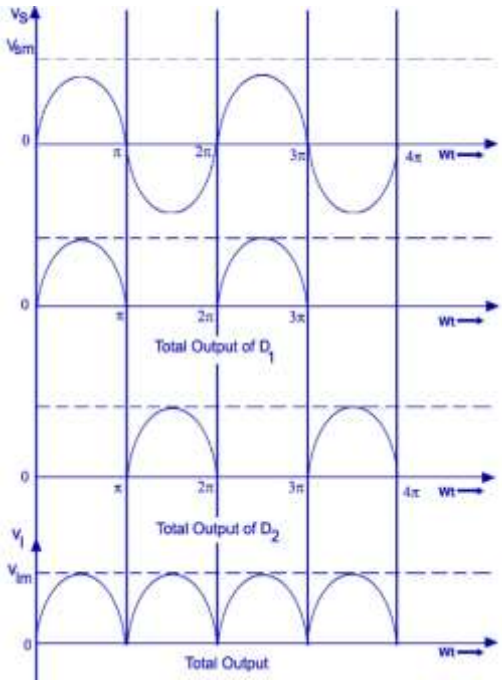
Full Wave Rectifier

Bridge Rectifier



Centre Tapped Rectifier





PROCEDURE

Connect the circuit as shown in the figure. Switch ON the power and compare the waveform in the CRO for the input and output.

RESULT

Successfully studied half wave and full wave rectifier circuits.

DISCUSSION

After comparing the waveforms of half wave and full wave rectifier, concept of the half wave and full wave rectifier is clear to us.

PRECAUTIONS

1. CRO connection should be carefully done
2. Connections should be proper and tight.
3. Switch "ON" the power after completing the circuit.
4. Traces of the waveform from the CRO should be taken carefully.