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Coimbatore-35
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DEPARTMENT OF CSE (IoT)

23ECT102- ELECTRONIC DEVICES AND CIRCUITS

I YEAR/ II SEMESTER

UNIT 5 – **Rectifier & Filters**

Half wave Rectifiers

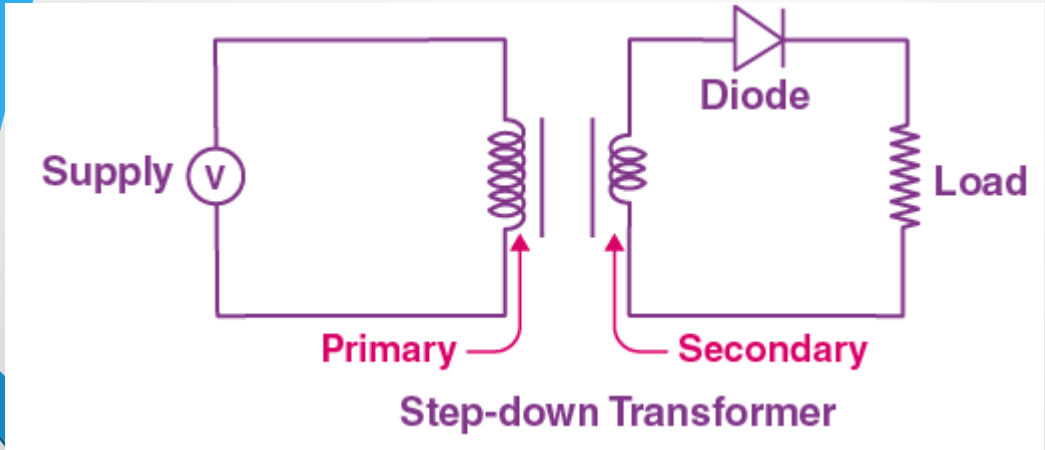
Half Wave Rectifier Circuit

A half-wave rectifier is the simplest form of the rectifier and requires only one diode for the construction of a halfwave rectifier circuit.

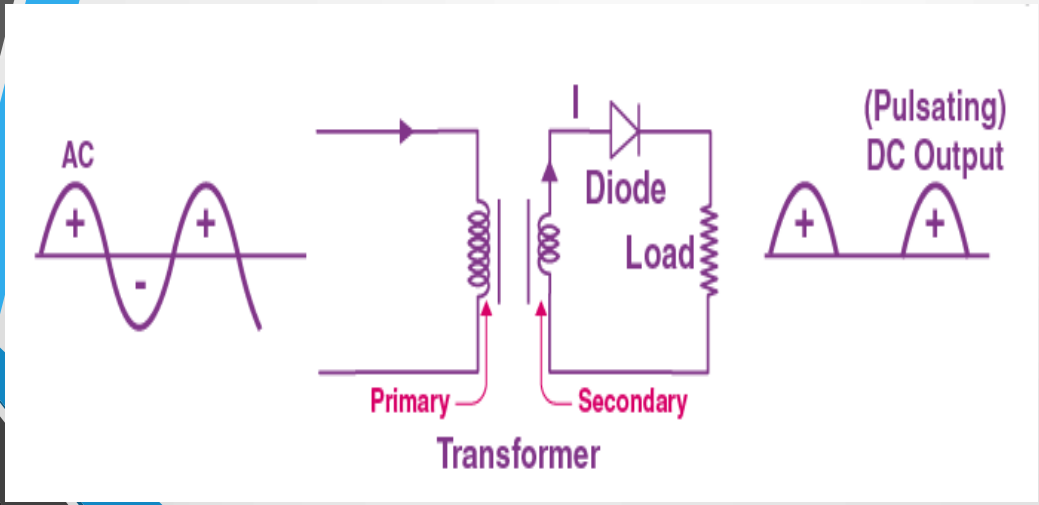
A halfwave rectifier circuit consists of three main components as follows:

- A diode
- A transformer
- A resistive load

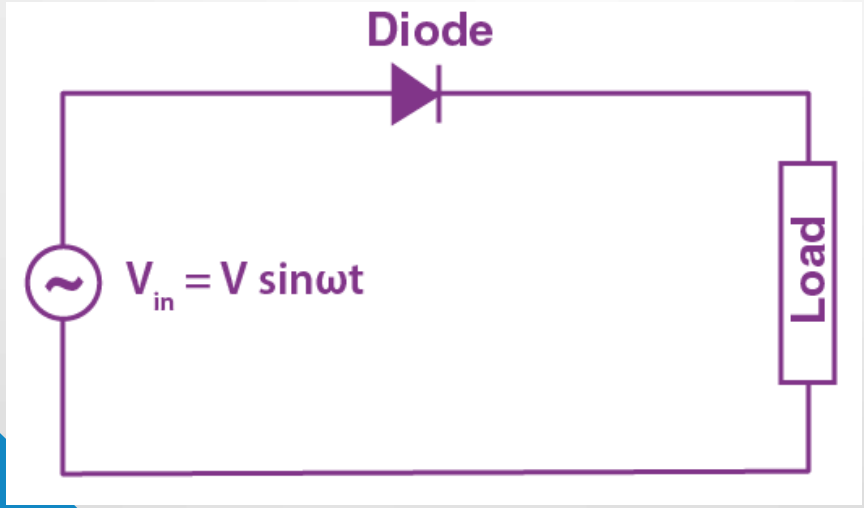
Half-wave rectifier diagram



Working of Half Wave Rectifier



- The half-wave circuit by replacing the secondary transformer coils with a voltage source

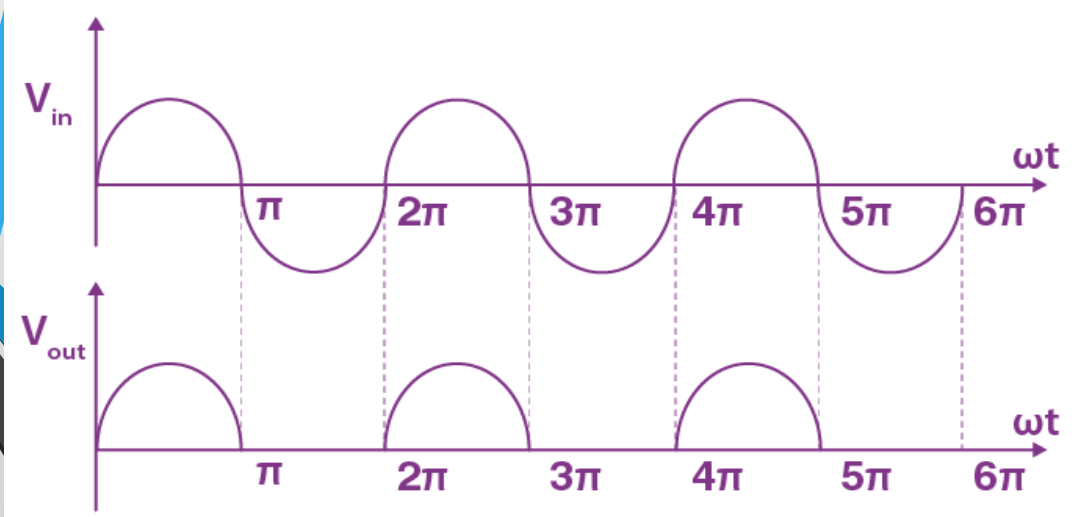


- For the positive half cycle of the AC source voltage, the circuit effectively becomes as shown below in the diagram:

- When the diode is forward biased, it acts as a closed switch. But, during the negative half cycle of the AC source voltage, the equivalent circuit becomes as shown in the figure below

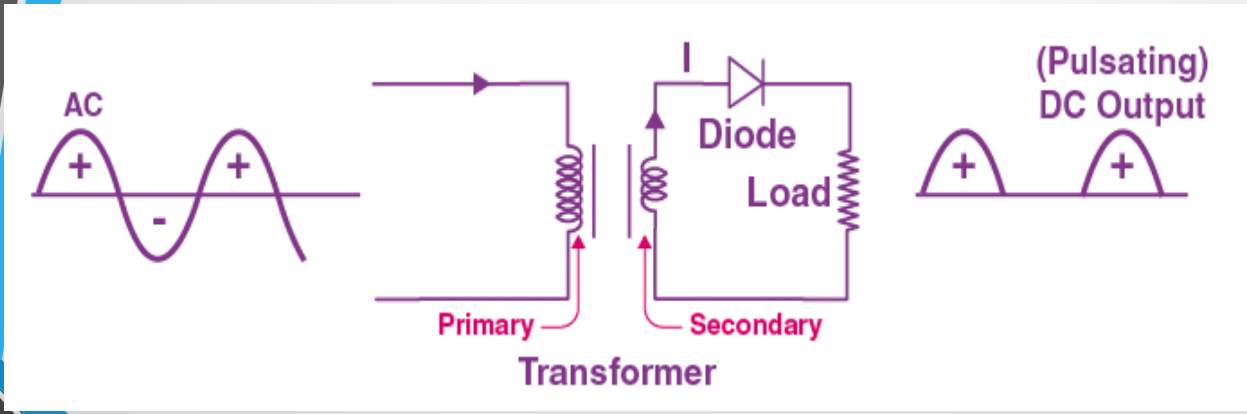
Half Wave Rectifier Waveform

- The halfwave rectifier waveform before and after rectification is shown below in the figure.



Half Wave Rectifier Capacitor Fi

- Filters in halfwave rectifiers are used to transform the pulsating waveform into constant DC waveforms. A capacitor or an inductor can be used as a filter.



Ripple Factor of Half Wave Rectifier

- Ripple factor can be quantified using the following formula:

$$\gamma = \sqrt{(\frac{V_{rms}}{V_{dc}})^2 - 1}$$

- The ripple factor of a halfwave rectifier is 1.21.

Efficiency of Halfwave Rectifier

- The efficiency of a halfwave rectifier is the ratio of output DC power to the input AC power.
- The efficiency formula for halfwave rectifier is given as follows;

$$\eta = \frac{P_{DC}}{P_{AC}}$$

RMS value of Half Wave Rectifier

- The RMS value of the load current for a half-wave rectifier is given by the formula:

$$I_{rms} = \frac{I_m}{2}$$

Form factor of a Halfwave Rectifier

- The form factor is the ratio between RMS value and average value and is given by the formula:

$$\text{Form Factor} = \frac{\text{RMS Value}}{\text{Average Value}}$$

Applications of Half Wave Rectifier

Here are a few common applications of half wave rectifiers:

- They are used for signal demodulation purpose
- They are used for rectification applications
- They are used for signal peak applications

Disadvantages of Half Wave Rectifier

- Power loss
- Low output voltage
- The output contains a lot of ripples