

## Experiment no.2

### § Half Wave Rectifier §

#### 2.1 Objective:

- To convert AC to DC.
- To be familiar with the half wave rectifier.

#### 2.2 Theory:

A half wave rectifier is a type of rectifier which allows only half cycle (either positive half cycle or negative half cycle) of the input AC signal while the another half cycle is blocked.

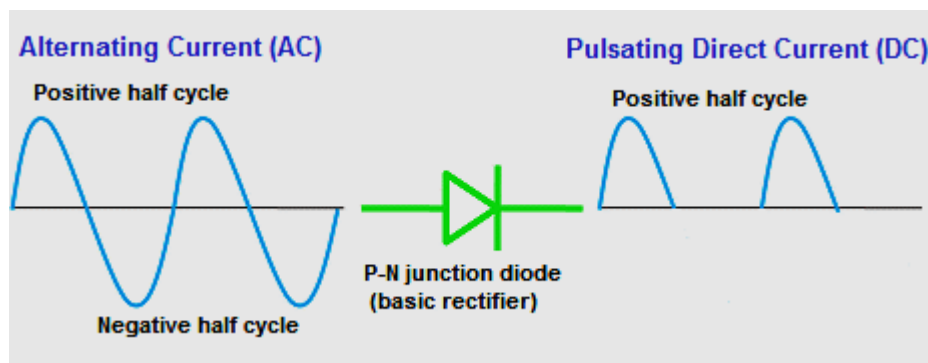


Figure (1)

For example, if the positive half cycle is allowed then the negative half cycle is blocked. Similarly, if the negative half cycle is allowed will not allow both positive and negative half cycles at the same time.

Therefore, the half cycle (either positive or negative) of the input signal is wasted.

The half wave rectifier is made up of an AC source, transformer (step-down), diode, and resistor (load). The diode is placed between the transformer and resistor (load).

### **Transformer**

Transformer is a device that reduces or increases the AC voltage. The step-down transformer reduces the AC voltage from high to low whereas the step-up transformer increases the AC voltage from low to high. In half wave rectifier, we generally use a step-down transformer because the voltage needed for the diode is very small. Applying a large AC voltage without using transformer will permanently destroy the diode. So we use step-down transformer in half wave rectifier. However, in some cases, we use a step-up transformer.

In the step-down transformer, the primary winding has more turns than the secondary winding. So the step-down transformer reduces the voltage from primary winding to secondary winding.

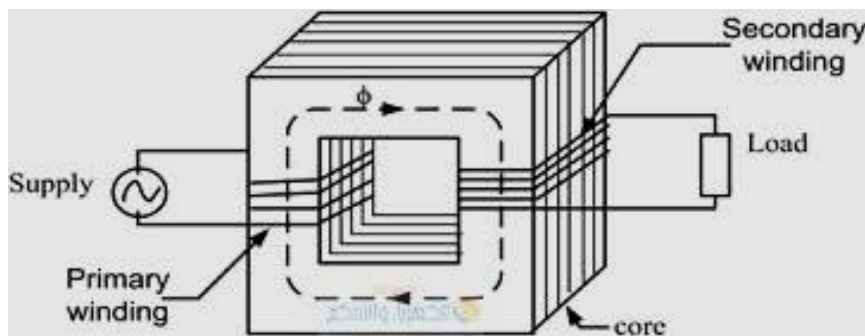


Figure (2)

### **Diode**

A diode is a two terminal device that allows electric current in one direction and blocks electric current in another direction.

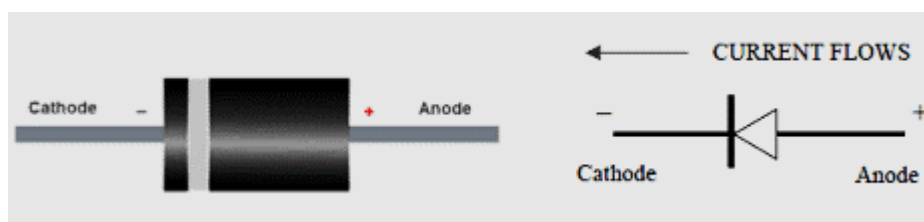


Figure (3)

## Resistor

A resistor is an electronic component that restricts the current flow to a certain level.

The low AC voltage produced by the step-down transformer is directly applied to the diode.

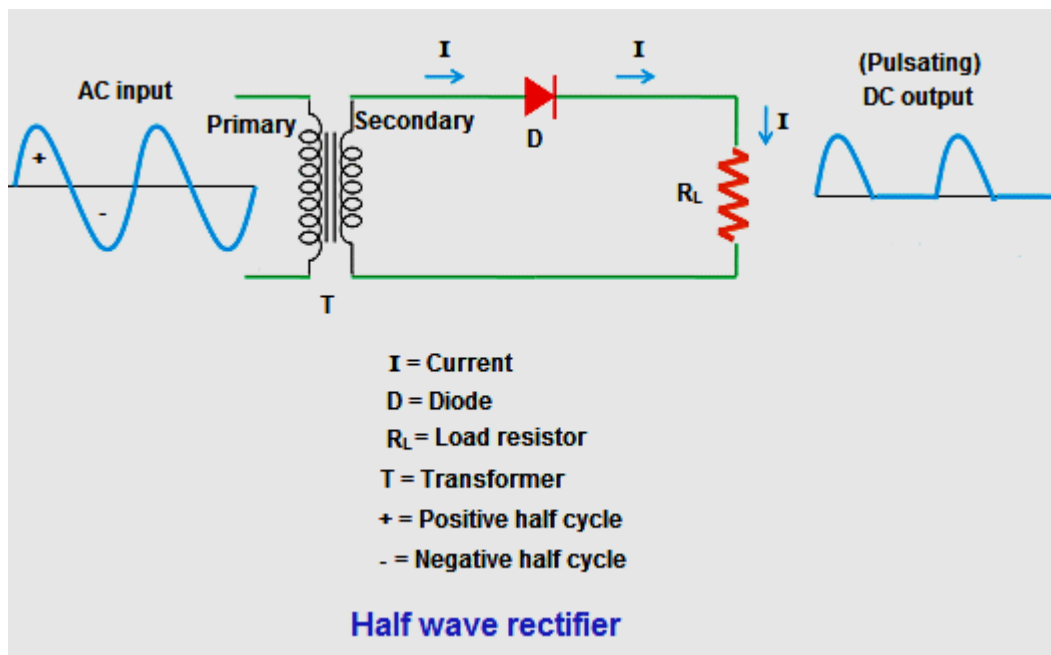


Figure (4)

When low AC voltage is applied to the diode (D), during the positive half cycle of the signal, the diode is forward biased and allows electric current whereas.

during the negative half cycle, the diode is reverse biased and blocks electric current. In simple words, the diode allows the positive half-cycle of the input AC signal and blocks the negative half-cycle of the input AC signal.

The construction and working of negative half wave rectifier is almost similar to the positive half wave rectifier. The only thing we change here is the direction of a diode.

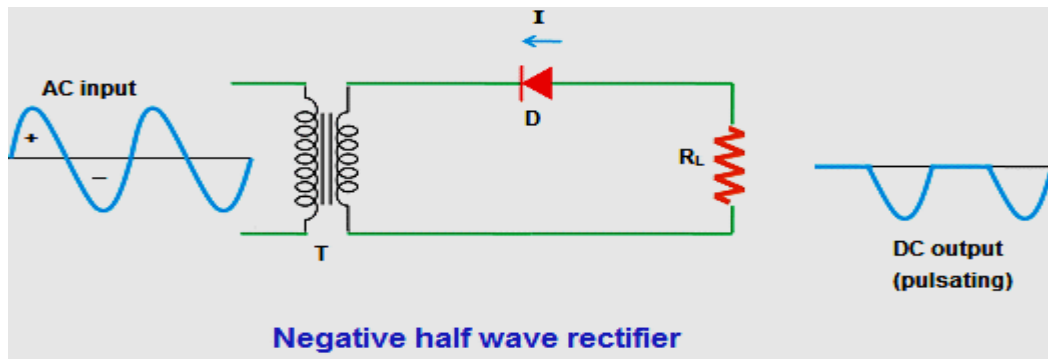


Figure (5)

During the negative half cycle, the diode is forward biased and during the positive half cycle the diode is reverse biased, so the negative half wave rectifier allows electric current only during the negative half cycle.

### 2.3 Procedure:

1. Connect the circle shown in the figure (4).
2. Set the function generator by an AC voltage (6 V) and a frequency (250HZ).
3. Connect the first terminal of the source to the first terminal of the diode, the second terminal of the diode to the first terminal of resistance and the second terminal of resistance to the second terminal of the source.
4. Connect the Oscilloscope to both ends of the resistance, Draw the wave shown in the screen of the Oscilloscope.

### 2.4 Discussion:

1. What is a diode? Explain and draw the Electrical symbol?
2. What is an electrical transformer? What are its types?
3. What is half wave rectifier?
4. Calculate the value of  $V_{r.m.s}$  and  $V_{d.c}$  for the output wave?

$$V_{r.m.s} = V_{peak} / 2$$

$$V_{d.c} = V_{peak} / \pi$$

- $(V_{av})$  or  $(V_{dc})$  average value of Output voltage.
- $(V_{peak})$  Peak voltage of input wave.
- $(V_{r.m.s})$  Root mean square of output voltages.