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Lab Report-01

Study and Observation of Half Wave Rectifier

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1 Experiment no: 01

2 Experiment Name:

Study and Observation of Half Wave Rectifier.

3 Objective:

3.1 Understanding Rectification:

To comprehend the basic principle of rectification and how it converts alternating current (AC) into direct current (DC).

3.2 Analysis of Diode Operation:

To study the behavior of the diode during the positive half-cycle of the AC input, understanding how it conducts and blocks current.

3.3 Observation of Output Waveform:

To observe and analyze the output waveform of the half-wave rectifier, specifically noting its pulsating nature and the absence of one half-cycle.

3.4 Measurement of DC Output:

To measure and calculate the average or DC component of the rectified output voltage, which represents the desired DC output.

3.5 Calculation of Ripple Factor:

To determine and analyze the ripple factor of the output waveform, indicating the presence of AC components in the rectified output.

3.6 Evaluation of Transformer Utilization Factor (TUF):

To calculate and understand the Transformer Utilization Factor, which measures how effectively the transformer is utilized in delivering power to the load.

3.7 Study of Load Resistance Effect:

To observe the impact of varying load resistance on the output voltage and current, studying the load characteristics of the half-wave rectifier.

3.8 Efficiency Calculation:

To calculate and evaluate the efficiency of the half-wave rectifier, providing insights into its effectiveness in converting AC power to DC power.

3.9 Analysis of Diode Parameters:

To understand how variations in diode parameters, such as forward voltage drop and reverse recovery time, affect the performance of the rectifier.

4 Theory:

A half-wave rectifier is a type of electronic circuit that converts alternating current (AC) to direct current (DC). It allows only one half-cycle of the AC waveform to pass through while blocking the other half. The most common configuration of a half-wave rectifier uses a single diode.Now we will show some key points about half-wave rectifier-

4.1 AC Input:

- The input to the half-wave rectifier is typically an AC sinusoidal waveform.
- The waveform is characterized by positive and negative half-cycles.

4.2 Diode Operation:

- A single diode is connected in series with the load resistor.
- The diode allows current to flow in one direction only (from anode to cathode).
- During the positive half-cycle of the AC input, the diode conducts and allows current to flow through the circuit.

4.3 Output During Positive Half-Cycle:

- When the AC input is positive, current flows through the diode and the load resistor, resulting in a voltage drop across the load.
- This creates a positive half-cycle output across the load resistor.

4.4 Blocking During Negative Half-Cycle:

- During the negative half-cycle of the AC input, the diode blocks the current, preventing it from flowing through the circuit.
- As a result, there is no output during the negative half-cycle.

4.5 Waveform Shape:

- The output waveform across the load resistor is characterized by a series of positive half-cycles only.
- The negative half-cycles are effectively removed, resulting in a pulsating DC waveform.

5 Required apparatus:

- Diode
- Resistor
- Alternator
- Oscilloscope

6 Circuit Diagram:

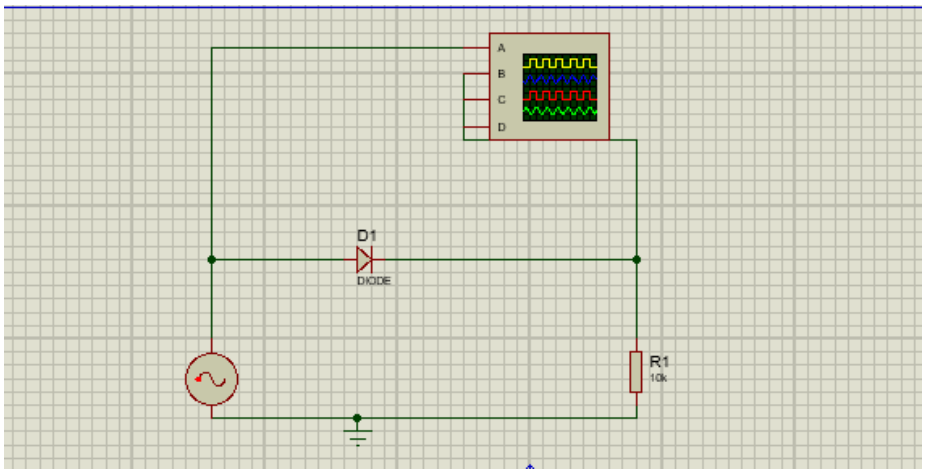

Figure 1: Circuit Diagram

7 Output:

Channel A's, Channel B's Output-

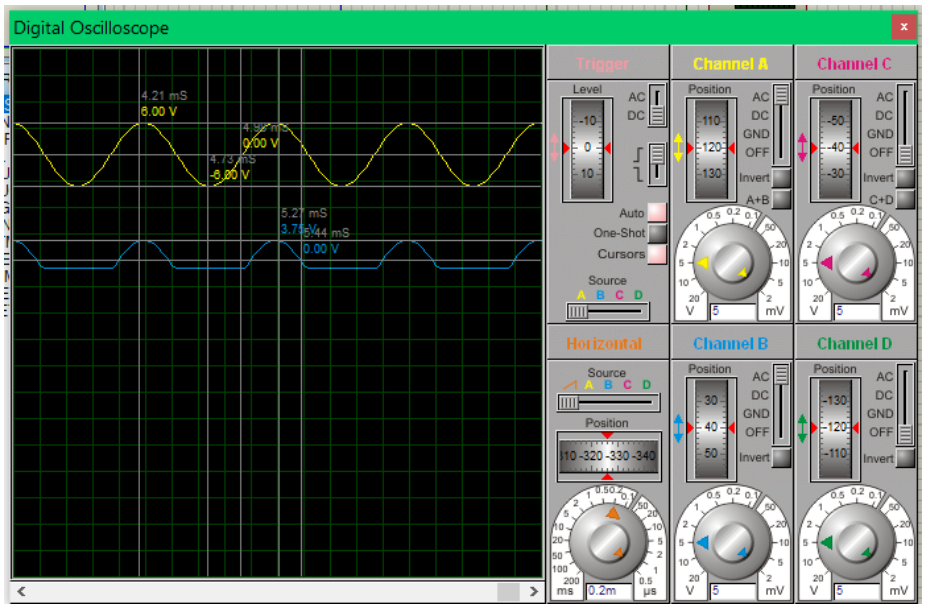

Figure 2: A's,B's" output

8 Discussion:

Here,
For channel A -
Wave top lies at 6.00 V, at this point time period =4.21mS
Wave feet lies at -6.00 V, at this point time period =4.73mS
And at 0.00V the time period = 4.98mS
SO, Time period,T = (4.98-4.21)mS
= 0.77mS
T/2 = 0.77/2
= 0.385mS

Again,
For channel B -
Wave top lies at 3.75V, at this point time period =5.27mS
Wave feet lies at 0.00 V, at this point time period =5.44mS
SO, Time period,T = (5.44 - 5.27)mS = 0.17mS