Heaven's Light is Our Guide
Rajshahi University of Engineering and Technology

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ECE 3206

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Industrial Electronics Sessional

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Lab Report 2:
Study of Diode Characteristics R, L, and Series Combination.

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Contents

Basics of Oscilloscope and Signal Generator

Theory

In this experiment, we investigate the characteristics of a diode under different load conditions using both DC and AC supplies. The experiment is conducted using simulation software to observe the behavior of the diode in various scenarios.

Diode Characteristics with DC Supply

When a diode is connected to a DC supply, it exhibits distinct forward and reverse bias characteristics. In forward bias, the diode allows current to flow through it once the applied voltage exceeds the threshold voltage (typically around 0.7V for silicon diodes). The current increases exponentially with the increase in voltage. In reverse bias, the diode blocks current flow, allowing only a very small leakage current until the breakdown voltage is reached [1].

Forward Bias

In forward bias, the diode's anode is connected to the positive terminal of the DC supply, and the cathode to the negative terminal. The I-V characteristic curve shows a rapid increase in current after the threshold voltage.

Reverse Bias

In reverse bias, the diode's anode is connected to the negative terminal of the DC supply, and the cathode to the positive terminal. The I-V characteristic curve shows a very small current until the breakdown voltage is reached, beyond which the current increases sharply.

Diode Characteristics with AC Supply

When a diode is connected to an AC supply, it exhibits rectification properties, converting the AC signal into a pulsating DC [2].

Required Equipments/Software

- Proteus Design Suite

- Oscilloscope

- Signal Generator

- Diodes (e.g., 1N4148, 1N4007)

- Resistors (various values)

- Capacitors (various values)

- Power Supply (DC and AC)

- Breadboard

- Connecting Wires
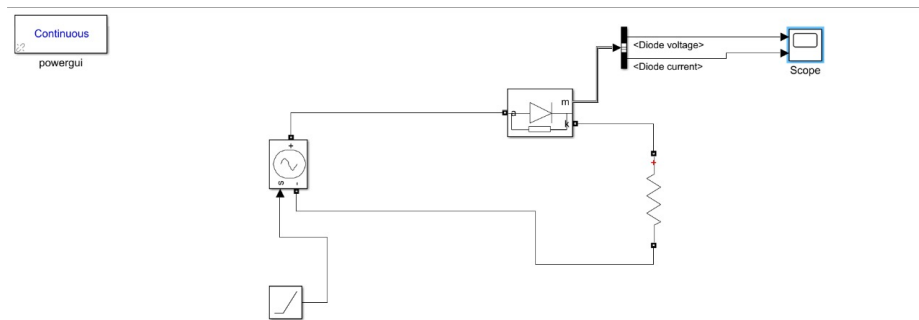
Circuit Diagrams
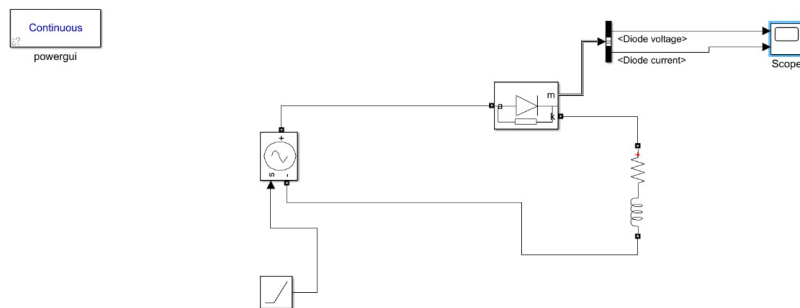

Figure 1: Diode with Resistive Load

Figure 2: Diode with Resistive-Inductive Load

Observations

- The diode conducts current in the forward bias and blocks current in the reverse bias.

- The diode exhibits rectification properties when connected to an AC supply.

- The load conditions (resistive, inductive) affect the diode's behavior and the output waveform.

- The output waveform changes based on the load conditions and the applied voltage.

- The diode's characteristics can be analyzed using an oscilloscope and signal generator.

- The diode's threshold voltage, forward current, and reverse current can be measured using the oscilloscope.

- The diode's response to different input signals can be observed using the oscilloscope.
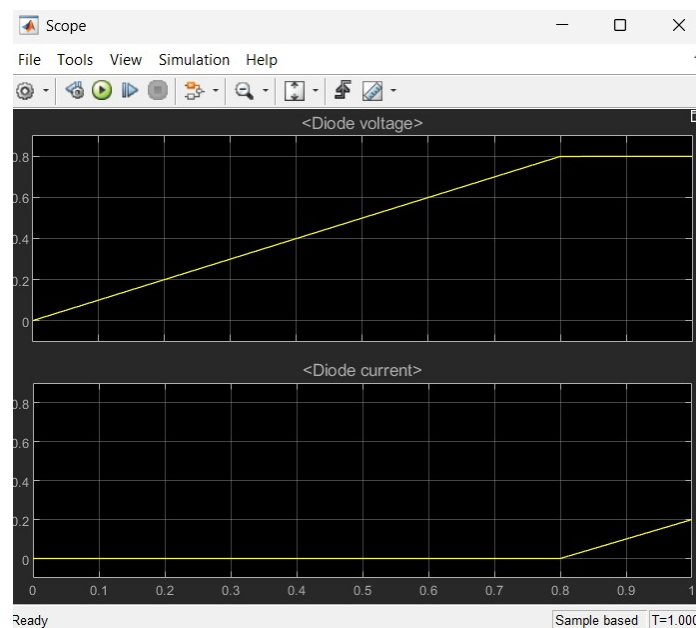
Outputs

Figure 3: Simulation Diagram of Diode Circuit With R Load
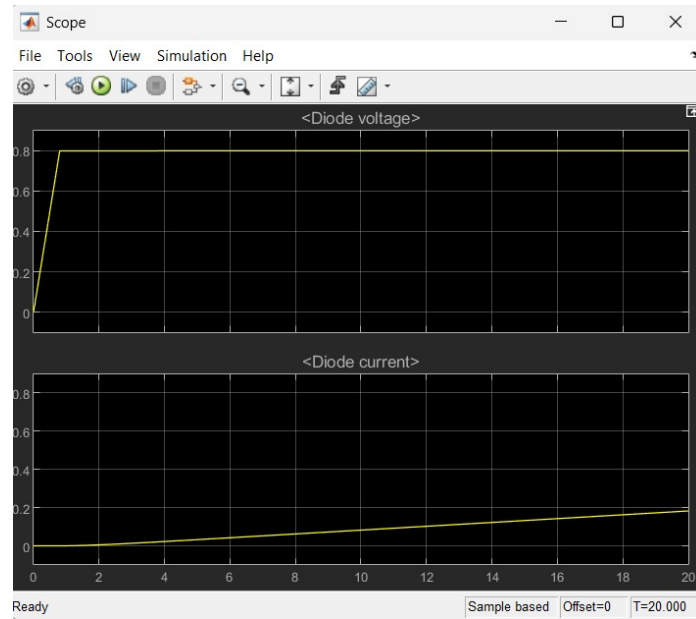
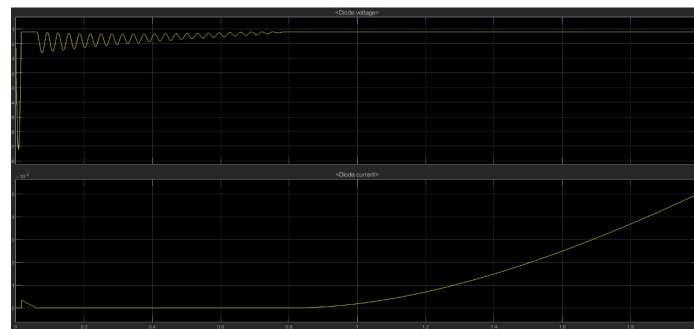Figure 4: Oscilloscope Output for Forward Bias With RL Load

Figure 5: Oscilloscope Output for RL Load

Discussion

The experiment demonstrates the diode's behavior under different load conditions and supply voltages. The diode's characteristics, such as forward bias, reverse bias, and rectification properties, are observed using simulation software. The oscilloscope and signal generator help visualize the diode's response to various input signals and load conditions. The experiment provides insights into the diode's operation and its applications in electronic circuits.

Conclusion

The experiment explores the characteristics of a diode under different load conditions using DC and AC supplies. The diode's behavior in forward bias, reverse bias, and

rectification is observed using simulation software. The oscilloscope and signal generator help analyze the diode's response to various input signals and load conditions. The experiment enhances understanding of the diode's operation and its applications in electronic circuits.

References

[1] A. Author, "Diode characteristics," *Journal of Electronics*, vol. 10, no. 2, pp. 123–130, 2020.

[2] B. Author, *AC Supply and Rectification.* Tech Books Publishing, 2018.