

Experiment-1

Making Half-Wave and Full-Wave Rectifiers with Simulink

OBJECTIVE:

The goal of this lab is to learn, make, and test half-wave and full-wave rectifiers using MATLAB Simulink.

TOOLS & SOFTWARE:

- Computer: A computer that has MATLAB on it.
- MATLAB Software: Make sure that MATLAB is on the computer.
- MATLAB Simulink: Use Simulink, a MATLAB tool for making, running, and checking different kinds of systems.

THEORY:

Half-Wave Rectifier:

A half-wave rectifier is a simple way to change an AC input into a DC output that goes up and down. It uses one diode to let current go only when the input is positive.

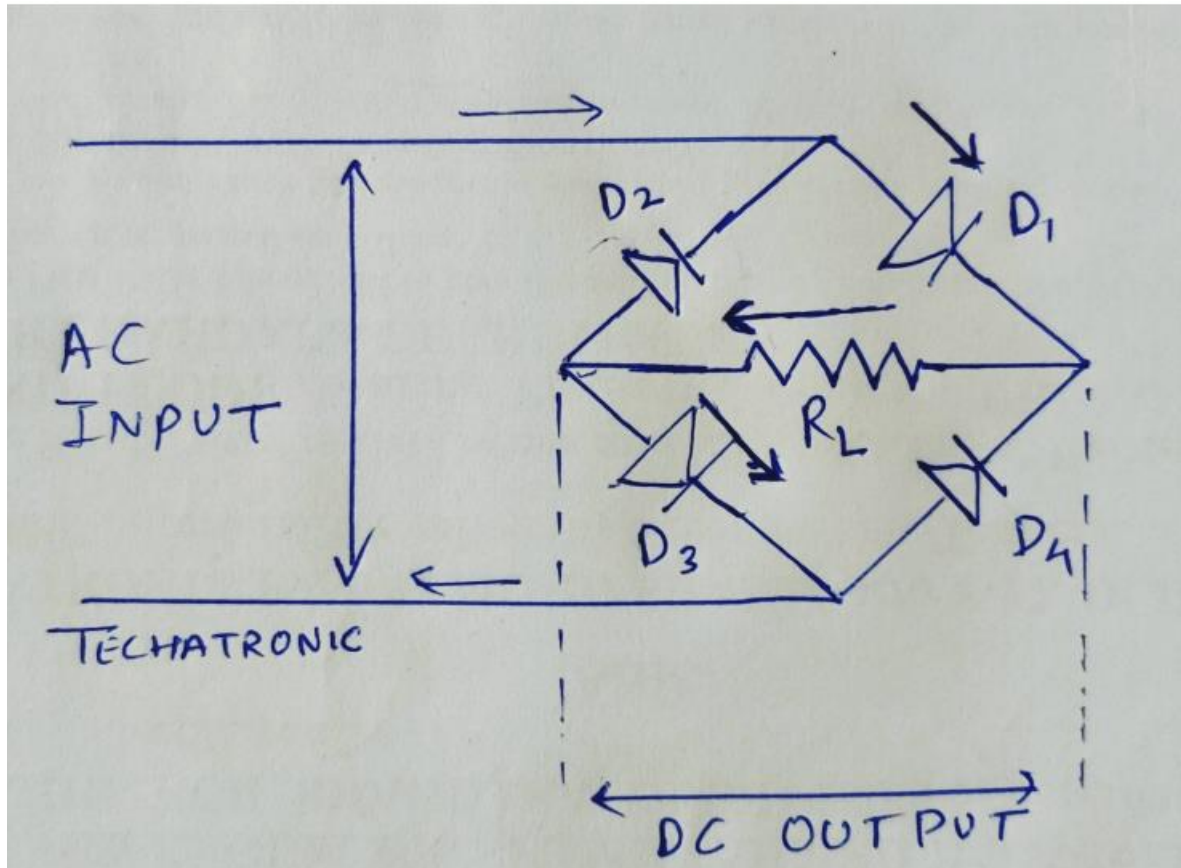
Full-Wave Rectifier:

A full-wave rectifier is a better way to change the whole AC input into a DC output that goes only one way. There are two main kinds of full-wave rectifiers:

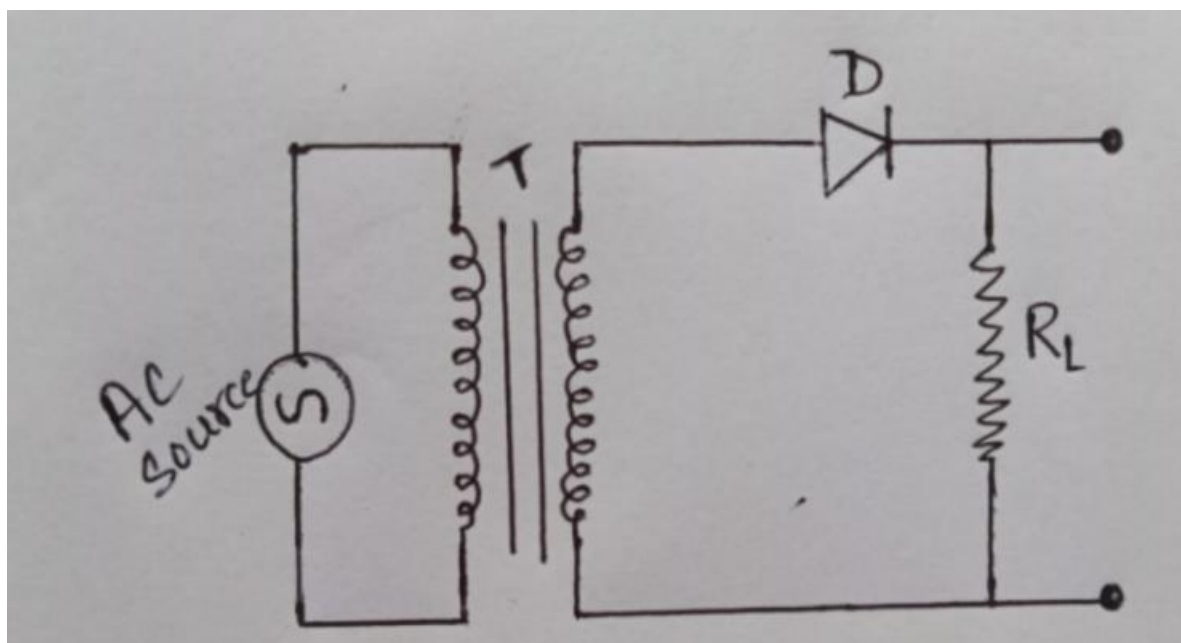
- **Centre-Tapped Full-Wave Rectifier:**
 - Uses a transformer with a middle point.
 - Uses two diodes, each one working for different parts of the input.
 - Gives two different output voltages, one for each part of the input.
- **Bridge Rectifier:**
 - Uses four diodes in a bridge shape.
 - Does not need a transformer with a middle point.
 - Works for both parts of the input, giving a steady DC output.

CIRCUIT DIAGRAMS:

HALF WAVE RECTIFIERS:



FULL WAVE RECTIFIERS:



PARTS OF THE CIRCUIT:

- AC Voltage Source (V_{in}): Gives the input AC signal.
- Diode (D): Lets current go only when the input is positive.
- Resistor (R): Makes the circuit work.

Part 1: Making a Half-Wave Rectifier with Simulink

- **Step 1: Making the Simulink Model**
 - Open MATLAB and make a new Simulink model.
 - Take these blocks from the SimPowerSystems library:
 - ❖ Voltage Source (AC) –
 - ❖ Diode
 - ❖ Resistor
 - ❖ Scope
- **Step 2: Setting the Parts**
 - Voltage Source (AC):
 - ❖ Choose how big, how fast, and how shifted the input is.
 - Diode:
 - ❖ Pick a good diode model.
 - ❖ Change how much voltage it drops and how long it takes to recover if needed.
 - Resistor:
 - ❖ Choose how much resistance it has.
- **Step 3: Connecting Parts**
 - Connect the AC Voltage Source to the Diode.
 - Connect the Diode to the Resistor.
 - Connect the Resistor to the Scope.
- **Step 4: Running the Model**
 - Set the model parameters (start time, stop time, solver options).
 - Run the model and see the output on the Scope.

Part 2: How to Make a Full-Wave Rectifier with Simulink

- **Step 1: Changing the Simulink Model**
 - Copy the model for the half-wave rectifier.
 - Change the Diode block with a Bridge Rectifier block from the SimPowerSystems library.
- **Step 2: Setting the Parts**
 - Bridge Rectifier:

- ❖ Set the block parameters (number of diodes, voltage drop, recovery time).

➤ **Step 3: Running the Model**

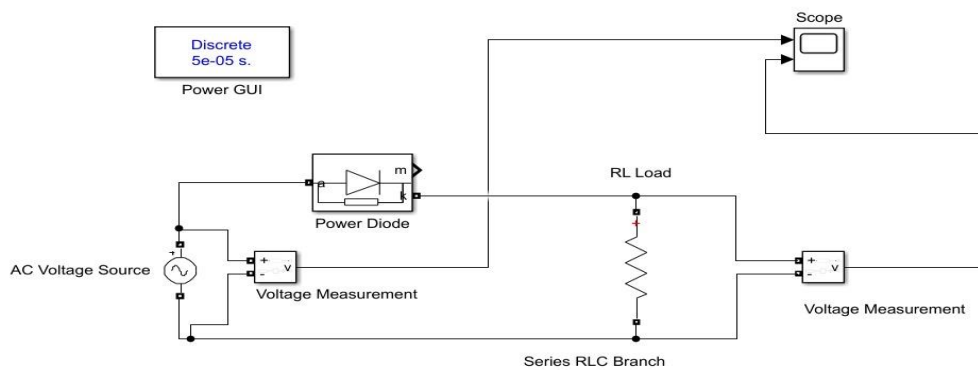
- Set the model parameters as in Part 1.
- Run the model and see the output on the Scope.

CHECKING AND FINISHING:

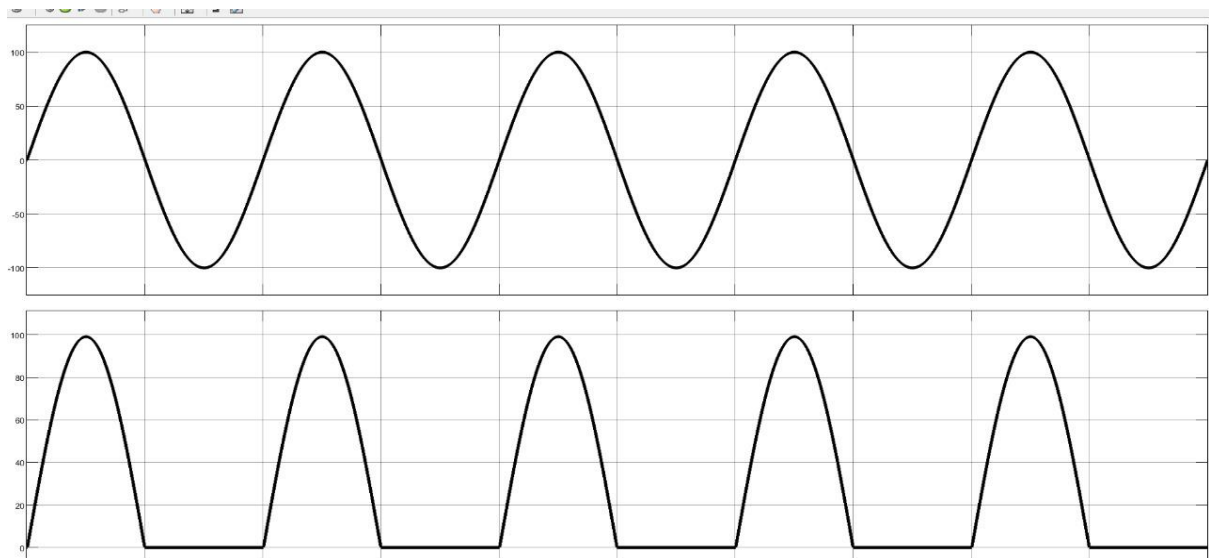
- Compare the outputs of the half-wave and full-wave rectifiers.
- Check how well they work and how smooth they are for each circuit.
- Talk about the good and bad points of each rectifier.

HALF WAVE RECTIFIER:

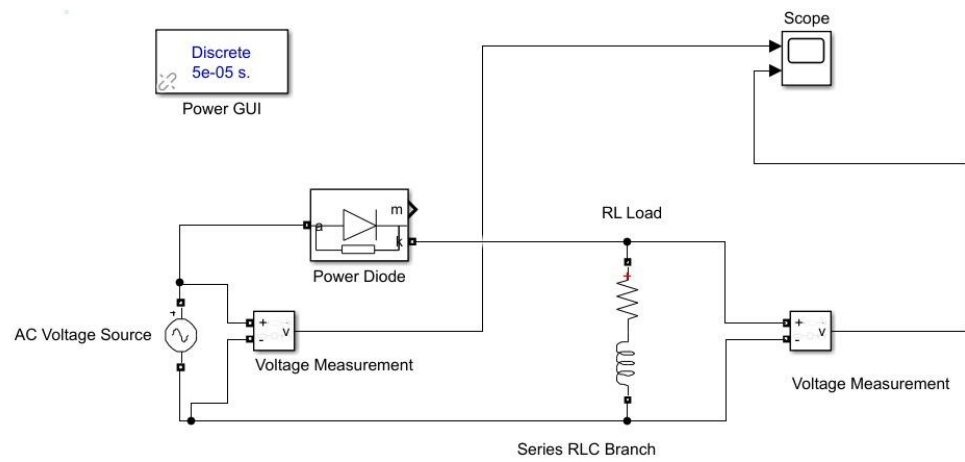
- WITH LOAD R:



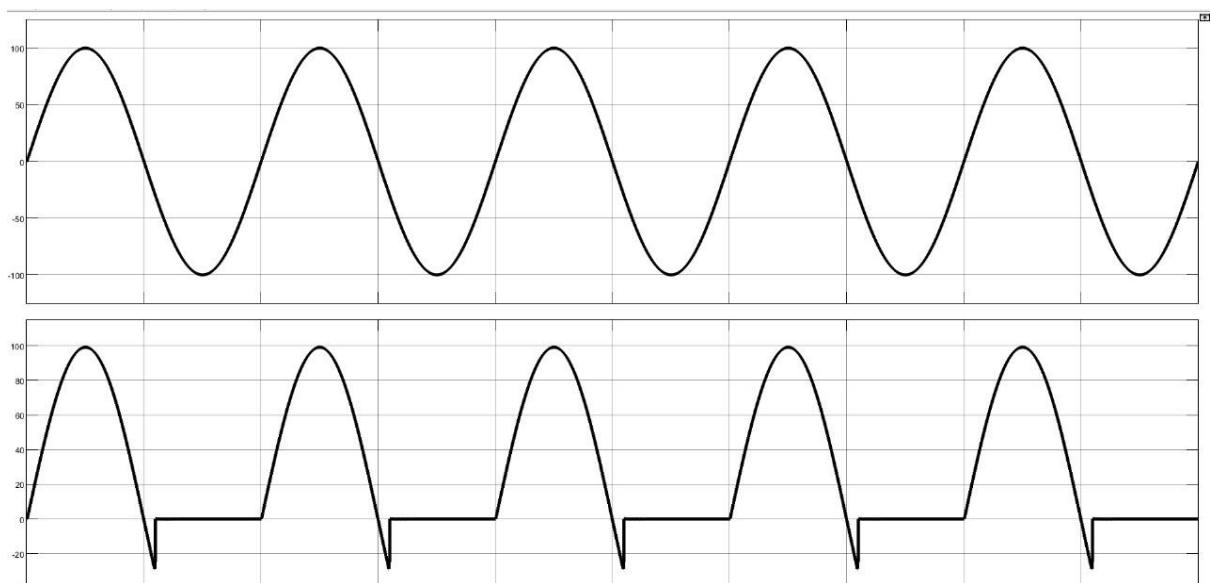
Output:



- WITH LOAD RL:

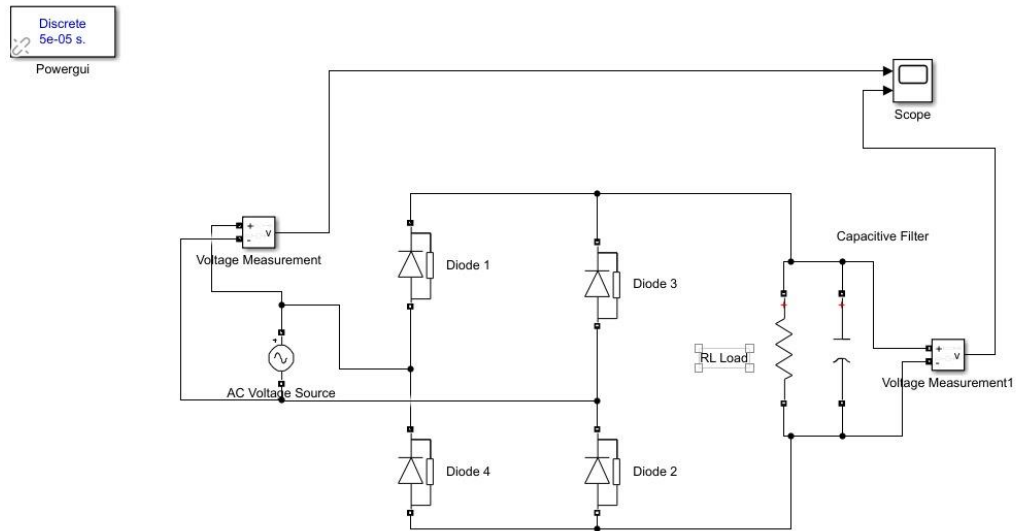


OUTPUT:

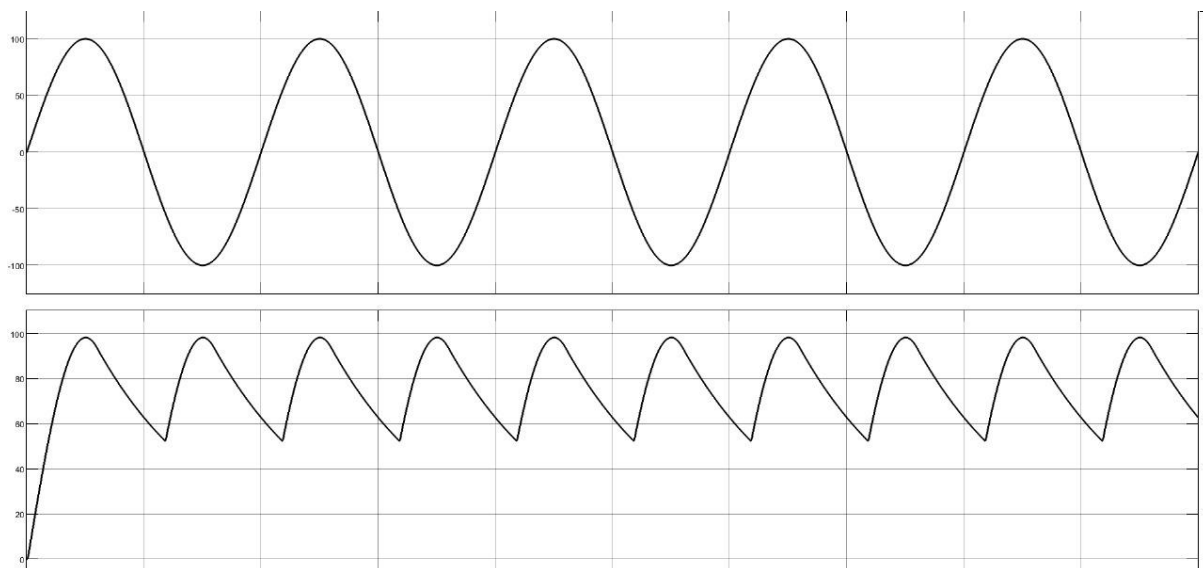


FULL WAVE RECTIFIER:

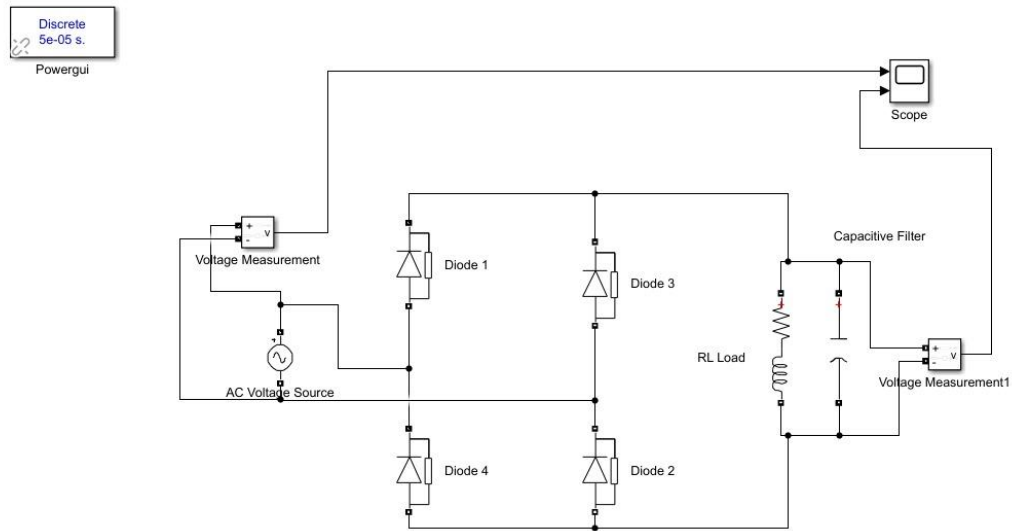
- WITH LOAD R:



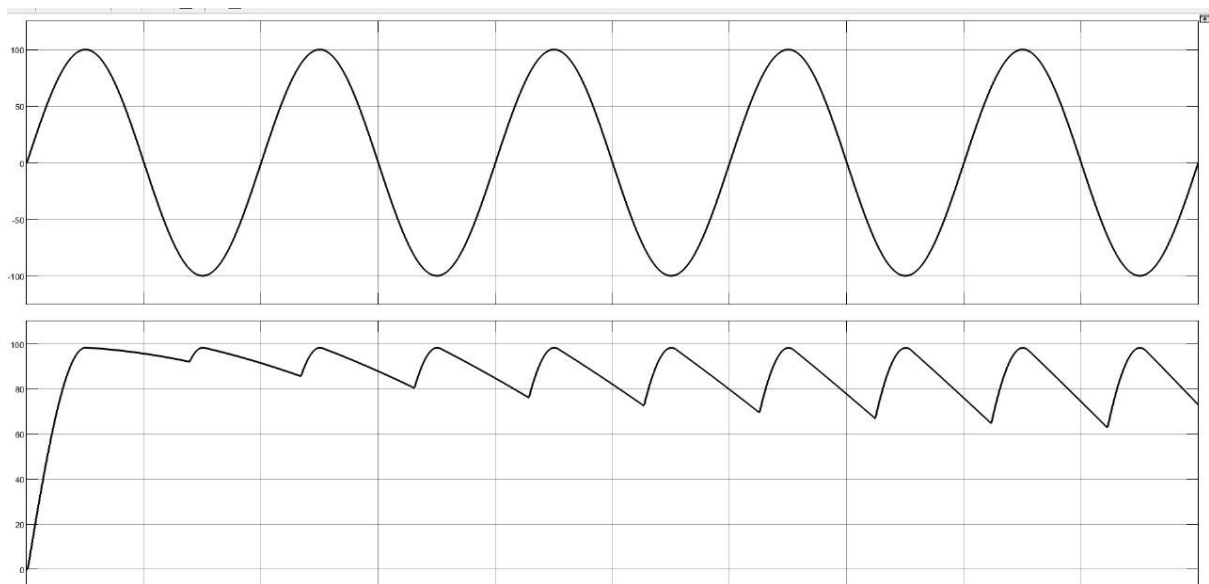
OUTPUT:



- WITH LOAD RL:



OUTPUT:



CONCLUSION:

- Make sure to write and label everything clearly in the Simulink model.
- Keep the Simulink models for later use.
- Try different values for the parts and see how they affect the rectifiers.