EEE 122

Lab report 01

Experiment name: To design and implement a half-wave rectifier circuit.

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Experiment name: To design and implement a half-wave rectifier circuit.

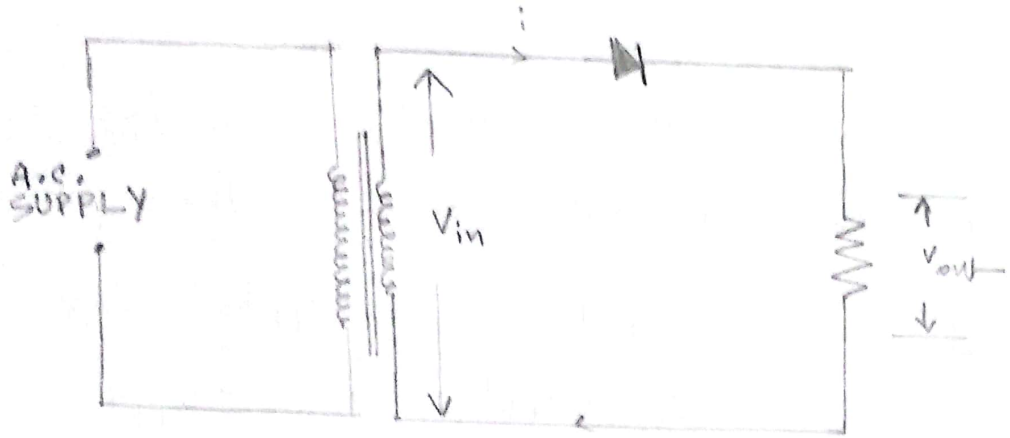
Theory:

During half-wave rectification, the rectifier conducts current only during the positive half-cycles of input a.c. supply. The negative half-cycles of a.c. supply are suppressed i.e. during negative half-cycles no current is conducted and hence no voltage appears across the load.

Operation:

The a.c. voltage across the secondary winding AB changes polarities after every half-cycle. During the positive half-cycle of input a.c. voltage, end A becomes positive w.r.t. end B. This makes the diode forward biased and hence it conducts current.

During the negative half-cycle, end A is



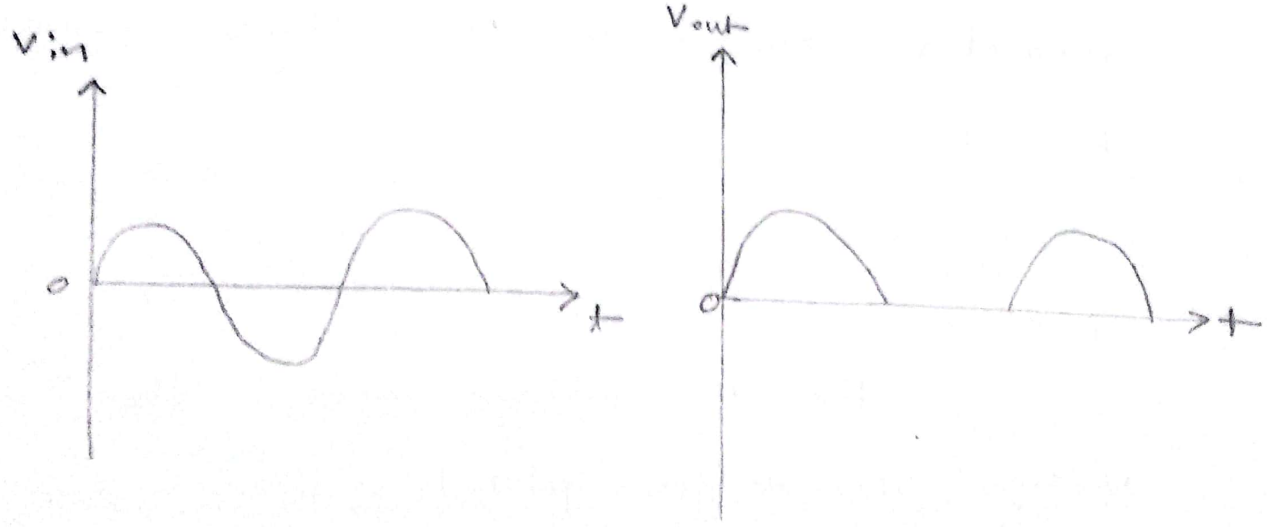


Figure: Half wave rectifier

negative w.r.t. end B. Under this condition the diode is reverse biased and it conducts no current. Therefore, current flows through the diode during positive half-cycles of input ac. voltage only. And also it is blocked in the negative half cycle. In this way current flows in the same direction.

Apparatus:

Function generator, regulated power supply, resistor, diode, Bread board, Oscilloscope, connecting wires, diodes, multimeter, transformers and capacitors as required.

Procedure:

1) Connect the circuit like the diagram
2) Give the input signal as required.

3) Switch on the power supply

4) Measure the output voltage and current using a multimeter or oscilloscope.

5) Record the obtained data including voltage ripple, output voltage and efficiency.

6) Analyze the performance of the half wave rectifier circuit.

7) Take necessary steps to remove the AC components from the output through ripple filter circuit.

Calculations:

Here, AC power input,

$$P_{ac} = I_{rms}^2 (r_f + R_L)$$

D.C. power output,

$$P_{dc} = (I_m/\pi)^2 \times R_L$$

$$\therefore \text{Rectifier efficiency} = \frac{P_{dc}}{P_{ac}} = \frac{(I_m/\pi)^2 \times R_L}{(I_m/2)^2 \times (r_f + R_L)}$$

$$= 0.406 \text{ or, } 40.6\%$$

$$\therefore \text{ripple factor} = \sqrt{\left(\frac{I_m/2}{I_m/\pi}\right)^2 - 1}$$

$$= 1.21$$

Discussion:

1) Diodes should be placed carefully with proper direction.

2) Resistance should be measured beforehand.

3) Proper thermal management is required.

4) Half wave rectifiers produce DC with ripple voltage. Filter circuits are required for a smoother output.

Lab report 02 (EEE 122)

Experiment : To design and implement a full wave bridge rectifier circuit.

Submitted by:

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Experiment name: To design and implement a full wave bridge rectifier circuit.

Theory:

The conversation of AC into DC is called rectification. Electronic devices can convert it implicitly. The bridge is composed of four diodes in a circle shape. During the positive half cycle, the end of the secondary winding becomes positive and other end negative. This makes diodes D_1 and D_3 forward biased while diodes D_2 and D_4 are reverse biased. Therefore only diodes D_1 and D_3 conduct.

During the negative half-cycle of secondary voltage, end becomes negative and the other end positive. This makes D_2 and D_4 forward biased whereas diodes D_1 and D_3 are reverse biased. Therefore in this case, only D_2 and D_4 will conduct.

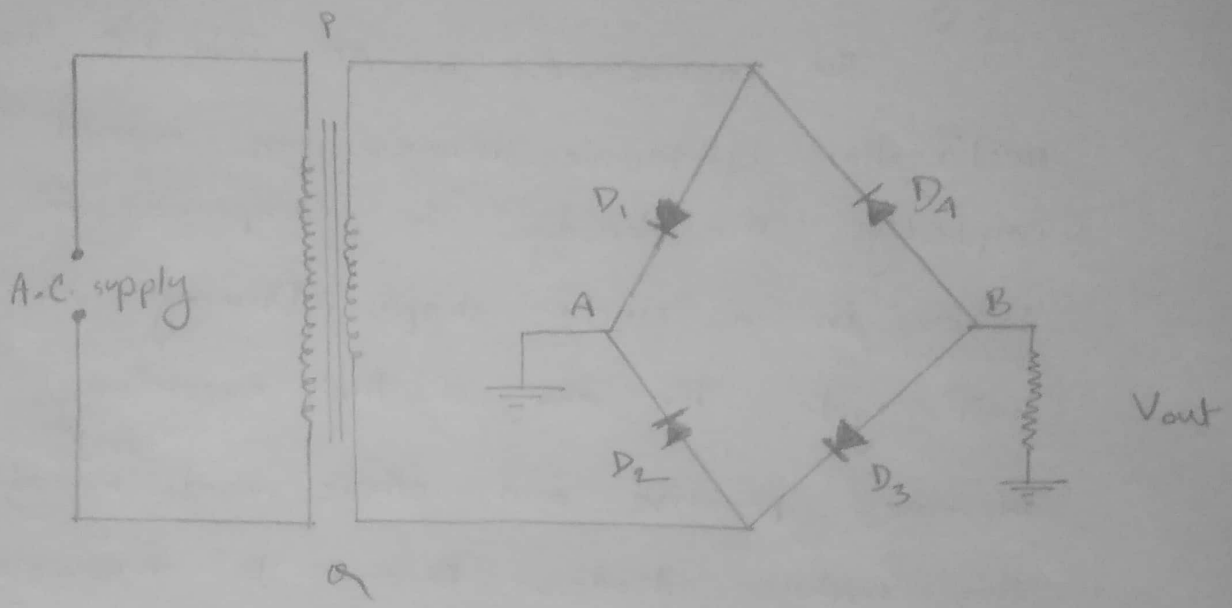

Figure: Full wave rectifier

Apparatus:

Bread board, Oscilloscope, Resistance, Connecting wires, diodes, multimeter, capacitors, transformer and regulated power supply.

Procedure:

1) Connect the circuit like the diagram
2) Give the input signal as required
3) Switch on the power supply
4) Measure the output voltage and current using a multimeter or oscilloscope.
5) Record the obtained data including voltage ripple, output voltage and efficiency.
6) Analyze the performance of the full-wave rectifier circuit.
7) Check ripple-factors. Also take necessary steps to decrease the AC amount from the output.

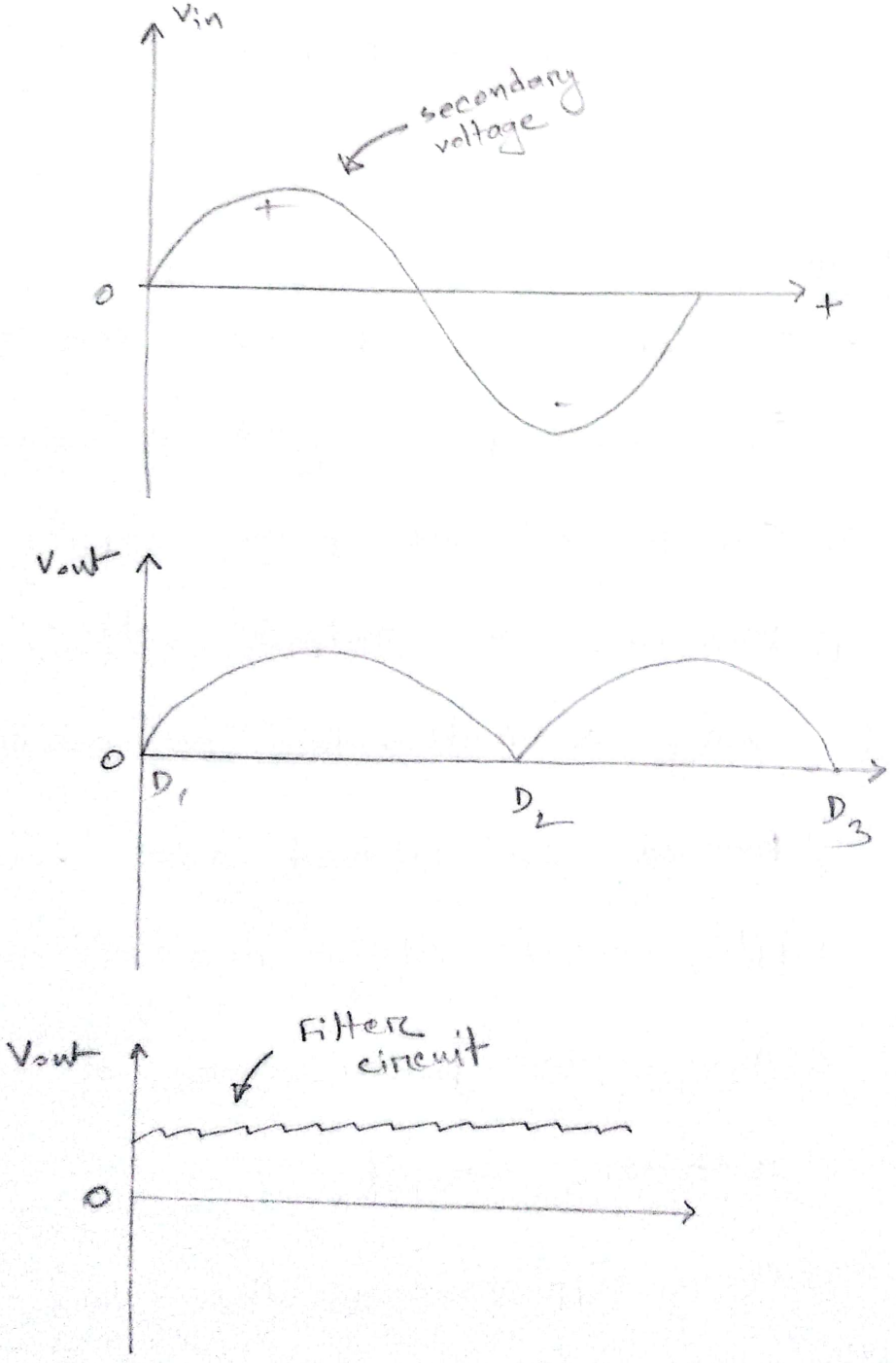

Figure: Graph of full-wave rectifier

Results:

1. Output waveform frequency = 1 kHz

2. Ripple factor

$$r = \sqrt{\left(\frac{I_m/\sqrt{2}}{2I_m/\pi}\right)^2 - 1}$$

$$= 0.48$$

3. Efficiency

$$\eta = \frac{\text{dc power output}}{\text{ac power input}}$$

$$= \frac{(2I_m/\pi)^2 R_L}{(I_m/\sqrt{2})^2 (r_f + R_L)}$$

$$= 0.812 \text{ or, } 81.2\%$$

Discussion:

1) Four diodes should be placed carefully with proper direction.

2) Resistance should be measured beforehand.

3) Proper thermal managemt is required

4) Proper grounding is required in the breadboard.