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5. **Objectives**

The objective of this lab was to design an electronic bridge rectifier. The purpose for designing one of these rectifiers is to convert AC to DC in circuits.

1. **Schematics/simulation results**

**E2.**

Diagram, schematic

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**Figure 1. Circuit to be designed and simulated in multisim.**

A picture containing diagram

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**Figure 2. This figure is the model from Figure 1 designed in multisim.**

A picture containing chart

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**Graph E2. This graph depicts VO from Figure 2.**

**E3.**

A picture containing diagram

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**Figure 3. This figure shows a similar circuit to that from Figure 2, however this one has a different value for the load resistance and has an added capacitor in parallel with the load resistance.**

|  |  |
| --- | --- |
| Vo [V] | Vr [V] |
| 6.18 | 0.780 |

**Table E3. Measured values once the circuit from Figure 3 is simulated.**

1. **Conclusions and remarks**

**C1.**

The Graph P2(a) better agrees with the manually derived transfer characteristic of Graph P1. This is because the period of each cycle matches the transfer characteristic better than Graph P2(b). The most consequential source of disagreement in this specific case are our diodes used in each case and their values. Sources of error, in general, are diode values or types, voltage types or frequencies possibly as well.

**C2.**

Diagram

Description automatically generated

**C4.**

Graph E2 and Graph P2(a) look similar. Graph E2 appears to be a horizontally compressed version of Graph P2(a). A discrepancy is that it appears that the voltage (y-axis) values seem ever so slightly different. A way to make it clearer would be to have had the same offset established in the voltage source.

**C6.**

The ripple of the voltage is smoothed by using the capacitor. This is because it attempts to hold the peak voltage across the load resistance. When the load is minimal, the load resistance is high and will have negligible current. The voltage across the load is nearly equal to ripple voltage across load. If capacitor is not placed, rippled would have a slight variation in it. However, if the load is large and load resistance is very small and current is also large, it will cause a small voltage across the load so there will be a slight change due to the ripple but will not affect the load very much. The previously mentioned applies for all voltages in the load, as the voltage across Rint is not affected. Based on this, our output waveforms are justifiable.

1. **Appendix/Prelab**

**P1.**Chart

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**P2.**

Diagram

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**Figure P1. Multisim circuit.**

Graphical user interface, chart, histogram

Description automatically generated

Chart, histogram

Description automatically generated

A picture containing graphical user interface

Description automatically generated

**Graph P2(a) of Figure 1.**

Diagram, schematic

Description automatically generated

**Figure P2. Values changed from Figure 1.**

A screenshot of a computer

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A screenshot of a computer

Description automatically generated with medium confidence

A screenshot of a computer

Description automatically generated

**Graph P2(b) for Figure 2.**

**P3.**

Diagram, schematic

Description automatically generated

**Figure P3. Ground is now shorted with negative source voltage.**

Chart, text

Description automatically generated

Graphical user interface, application

Description automatically generated

A screenshot of a computer

Description automatically generated

Note: Does not seem to be graphable in the simulator, as this is not correct.

**Graph P3(a) of Figure 3.**

**P4.**

A whiteboard with writing on it

Description automatically generated with medium confidence

Diagram

Description automatically generated

**Figure P4. Capacitor is now in parallel with resistor.**

Chart

Description automatically generated

Graphical user interface, chart, histogram

Description automatically generated

A screenshot of a computer

Description automatically generated

**Graph P4(a) for Figure 4.**

Chart, histogram

Description automatically generated

Graphical user interface

Description automatically generated

A screenshot of a computer

Description automatically generated

**Graph P4(b) for Figure 4. Done with RL = 56k Ohms.**

Graphical user interface, histogram

Description automatically generated

Graphical user interface

Description automatically generated with medium confidence

A screenshot of a computer

Description automatically generated

**Graph P4(c) for Figure 4. RL was set to 560 Ohms here.**