Experiment 7
Rectifiers, Capacitors and Inductors

Ahmet Akman 2442366
Assistant : Uğur Berkay Saraç

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Contents

1 Introduction

In this experiment, as students, we are expected to experiment with rectifiers, capacitor and inductor circuits by completing the steps described in the seventh experiment laboratory manual. Throughout these steps, the half full rectifier circuit structures and ripple voltages are expected to be learned. The output versus input characteristics is observed by connecting the signal generator to the oscilloscope and the circuit. Also, the measurement techniques for capacitance of capacitors and inductance of inductors are expected to be expressed and experimented. The results of the steps were recorded and plotted for further comments.

2 Experimental Results

In this section, the results of Experiment 7 are discussed.

2.1 Step 1

In this step, circuit shown in the Figure 1 is constructed.

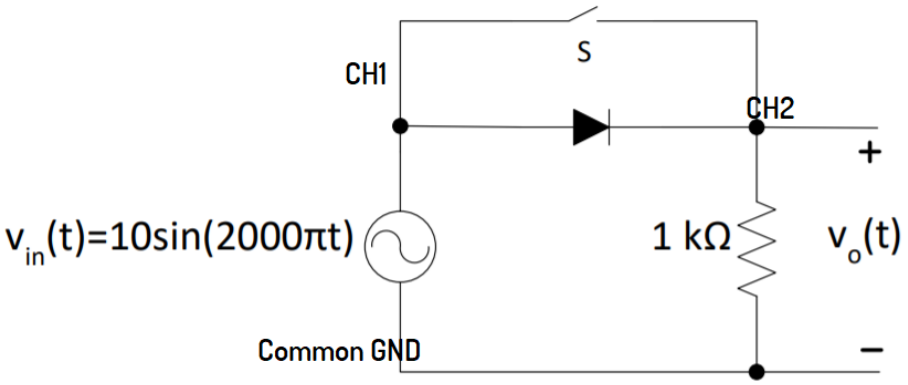

Figure 1: Half wave rectifier circuit

2.1.1 a)

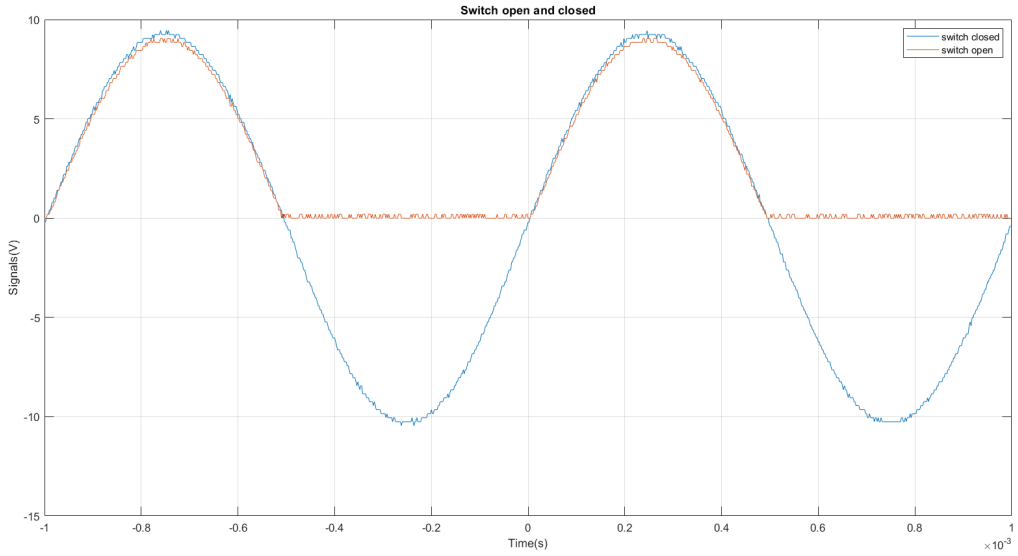

Figure 2: Output waveforms

2.1.2 b)

2.2 Step 2

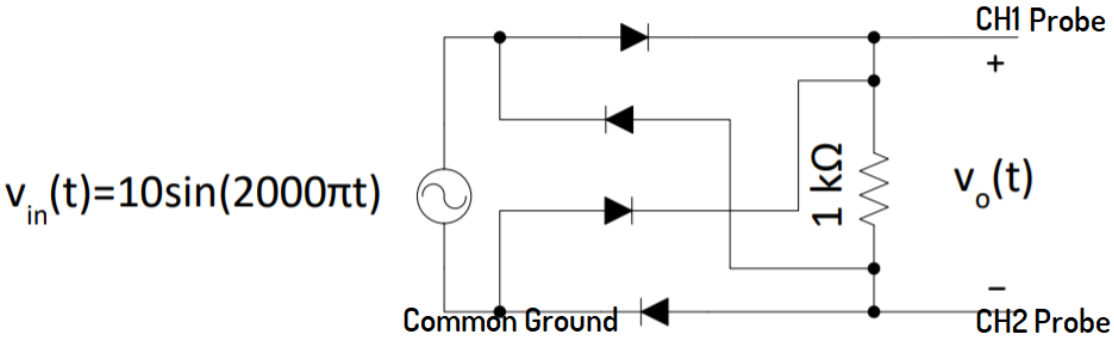

Figure 3: Full wave rectifier circuit

2.2.1 a)

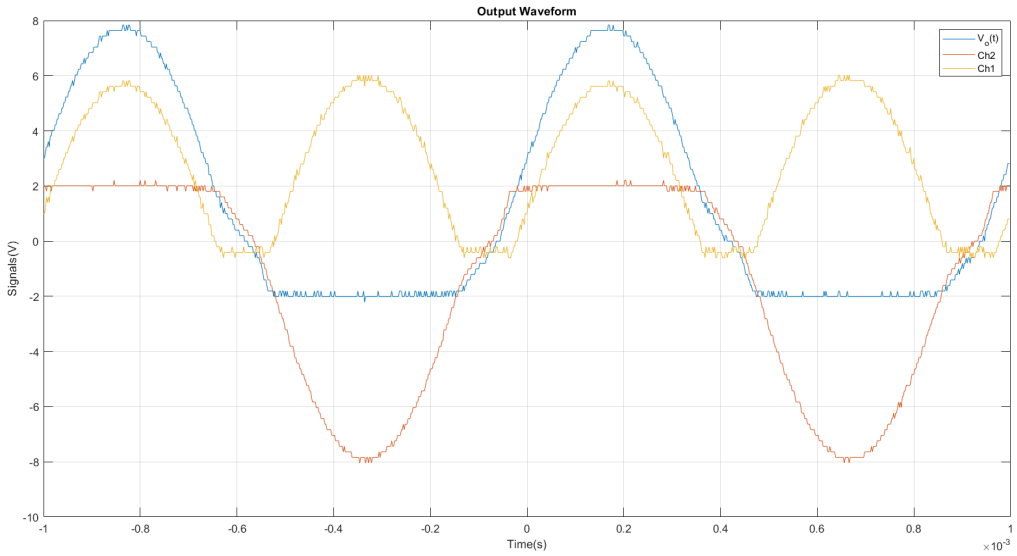

Figure 4: Output waveforms

2.2.2 b)

2.2.3 c)

2.3 Step 3

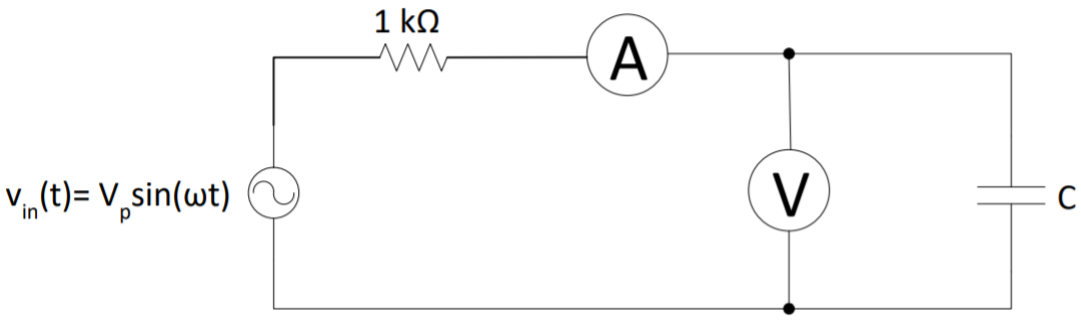

Figure 5: Capacitor measurement circuit

Table 1: Measurements for the capacitor circuit

	Capacitor	Resistor
Voltage Reading	1.1518 V	1.69 V

2.4 Step 4

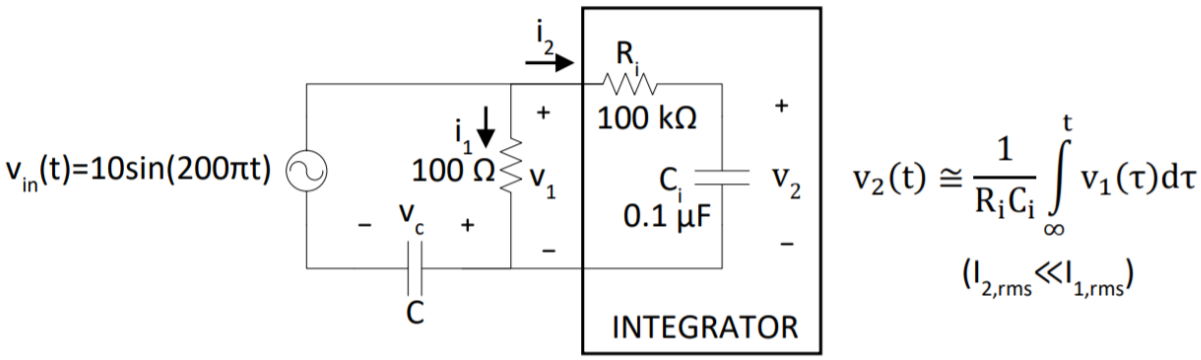

Figure 6: Circuit for the capacitance finding method

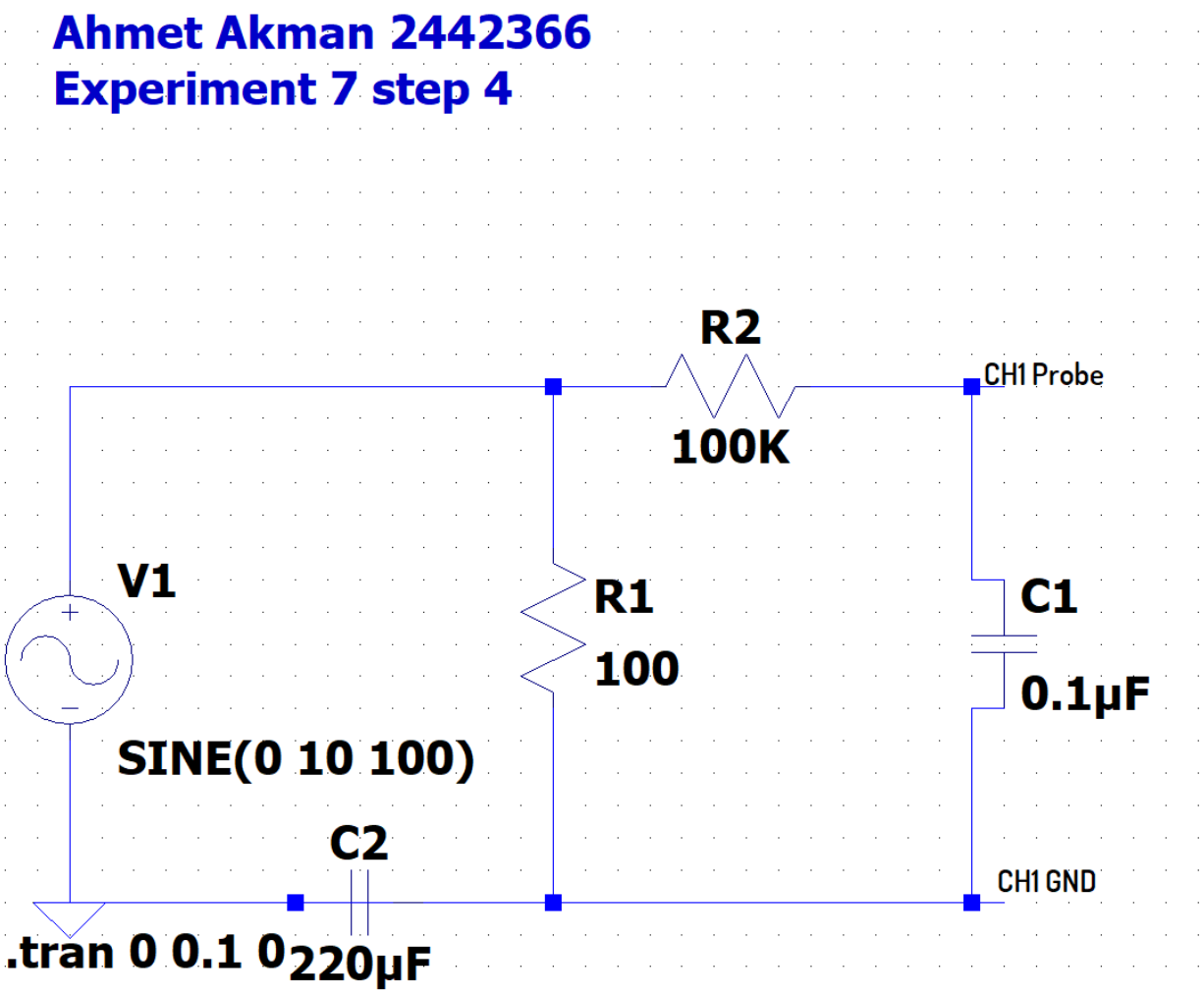

Figure 7: Simulation circuit for the capacitance finding method

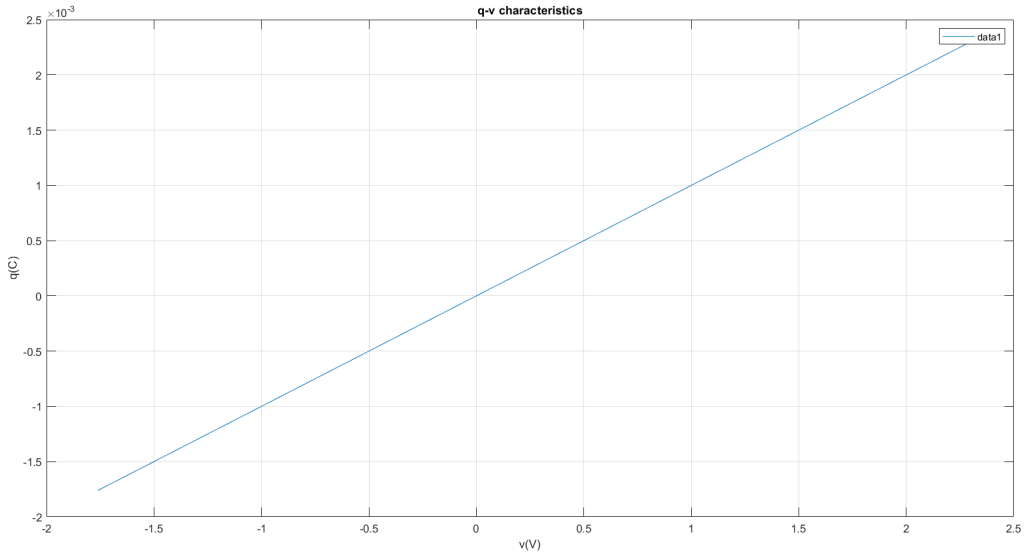

Figure 8: q-v characteristics

2.5 Step 5

Table 2: Measurements for the wooden inductor circuit

	Inductor	Resistor
Voltage Reading	0.68321 V	1.862 V

Table 3: Measurements for the compact inductor circuit

	Inductor	Resistor
Voltage Reading	0.59929 V	1.912 V

Table 4: Measurements for the inductors

	Wooden	Compact
LC Meter Reading	0.15 H	0.08 H
Resistance Reading	29.13 Ω	3.950 Ω

2.6 Step 6

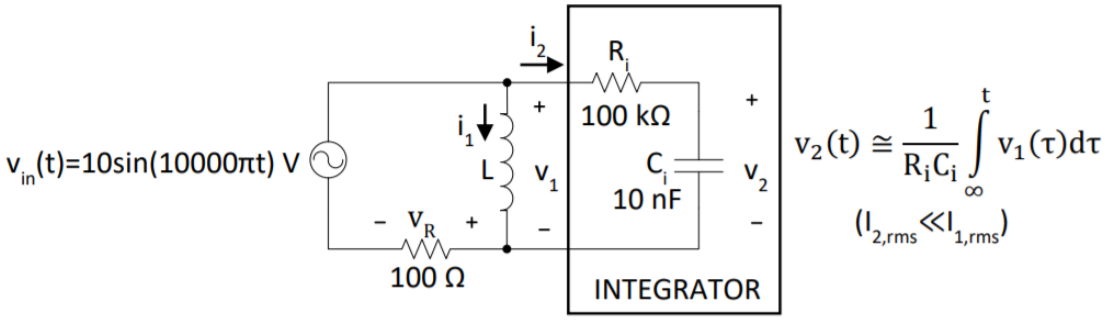

Figure 9: Circuit for the inductance finding method

2.6.1 a)

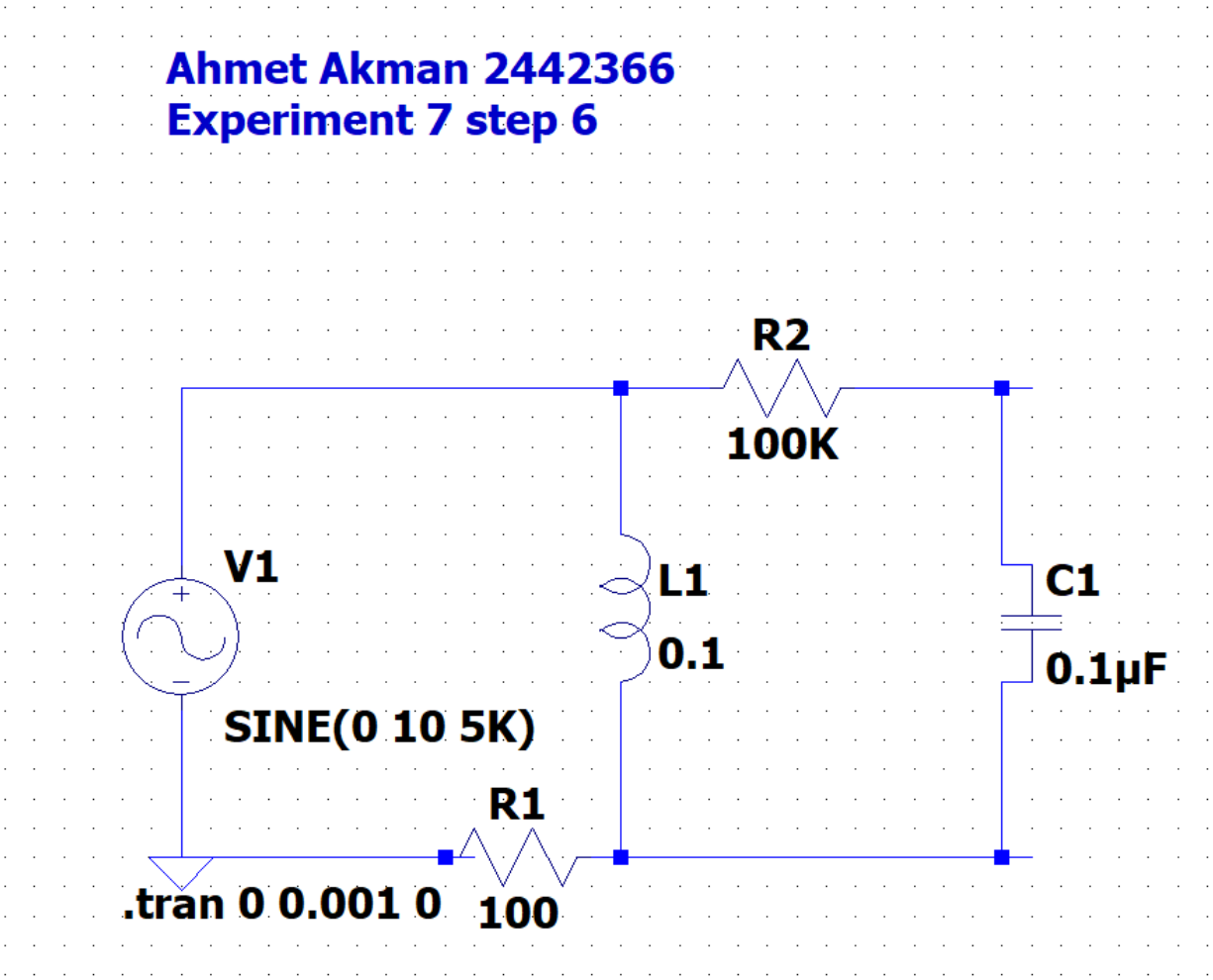

Figure 10: Simulation circuit for the inductance finding method

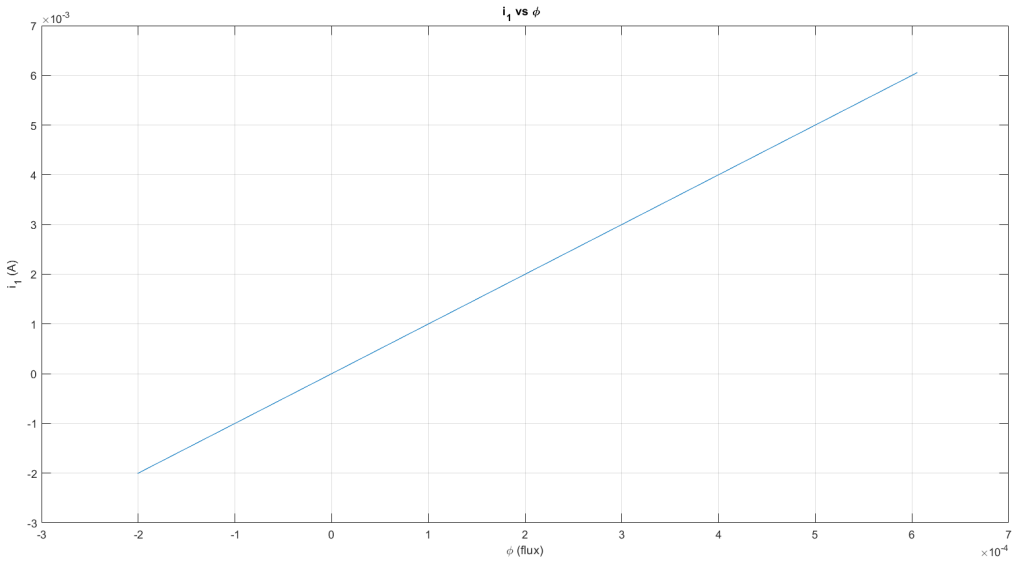

Figure 11: ϕvsi characteristics plot

2.6.2 b)

3 Conclusion

The non-ideal behavior of the components is compared with the ideal simulation plots.

In conclusion, in experiment 6, "Operational Amplifiers-II," as students, we have learned how various functional circuit setups of Op-Amps can be constructed. Preliminary laboratory work is done via simulations of the Op-Amp circuits in an LTSpice environment and by hand calculations. As students, we have observed how the amplifying job can be done in two-stage and its advantages. We have seen the effect of non-linear feedback on the Op-Amp setup. The characteristics of the negative resistance converter are observed. Also, implementing darkness and lightness sensors has experienced a real-life design approach. Lastly, a difference amplifier circuit is set, and the characteristics are observed with measurements. To sum up, in this experiment, as students, we have experimented with how different kinds of operational amplifier circuits operate.

Appendix I

Total time spent on/during:

- Pre-lab preparation: 6.5 hours (including the preliminary work and simulations)
- Experimental work: 2 hours (hours spent in lab)
- Report writing: 6 hours

Appendix II

The outputs of the simulations are fetched from LTSpice and plotted in MATLAB.