

EE2CI5 LAB 3

RC and RL Circuits

Objective

The objective of this lab is for you to become familiar with the behavior of RC and RL circuits and the characteristics of energy storing elements. It will also help to enhance measurement skills in the laboratory.

Equipment:

- 1) Function generator
- 2) Digital Oscilloscope

Components:

- 1) *Resistors*: one each: 330 Ω , 680 Ω , 4.7K, 1K, 10K, and 20K
- 2) *Capacitors*: one 0.1 μF ,
- 3) *Inductor*: one, with a value to be determined through measurement

1. Measurement of Inductance:

Procedure:

An inductor, along with several values of resistors, will be supplied to you in the lab. Propose a method to calculate the value of the inductor. Then, go into the lab and try out your method. *Hints*: Consider using time constants. A square wave on your function generator simulates the opening and closing of a switch.

The inductor can be modeled as an ideal inductor in series with a resistance, which is that due to the wire. Determine the value of this series resistance by measuring it with your ohmmeter. Include the effect of this resistance in your calculations.

Finally, insert a pair of wire cutters into the interior of the inductor while viewing the voltage waveform across the inductor. Explain the effect that you see.

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In your report for this section, carefully explain the theory behind your method. Include plots of any pertinent waveforms.

2. Design of a Time Constant

Design a resistive circuit with 2 or 3 nodes or meshes that includes one 0.1 μ F capacitor.

The design objective is to get the time constant of the voltage waveform across the capacitor to be as close as possible to 0.1mS. Use the resistor values supplied.

Explain carefully your theoretical analysis for this question. Explain how you arrived at your design. Compare your theoretical analysis with your measured responses. Include relevant waveforms in your report.