

ECE 207L - SECOND ORDER CIRCUITS - LAB 21 STEP RESPONSES OF 2ND ORDER RLC CIRCUITS - PART I

FALL 2003

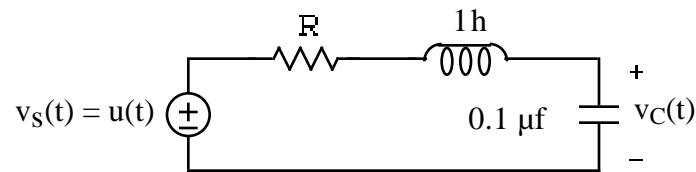
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OBJECTIVE

The objective of this lab is to measure the step responses of underdamped 2nd order series RLC circuits.

LAB

1. Given the following underdamped 2nd order series RLC circuit



PARTNER 1: $R = 680\Omega$ PARTNER 2: $R = 500\Omega$

- a. Measure the values of your circuit elements. Compare with nominal values
- b. Display the step response of $v_C(t)$ on your scope. Then sketch a graph of what you see.
- c. Explain how you can tell from your result in part (b) that the circuit is underdamped
- d. Make use of what you see on your scope to estimate the parameters b and a of the step response as follows

$$v_C(t) = 1 + Ke^{at} \cos(bt + \theta)$$

Hint - find a by finding the values of $v_C(t)$ at two times t_1 and t_2 where $\cos(bt_1 + \theta) = \cos(bt_2 + \theta) = 1$. Then make use of the following equations to solve for a

$$v_C(t_1) = 1 + Ke^{at_1} \quad \text{and} \quad v_C(t_2) = 1 + Ke^{at_2}$$

- e. Analyze your circuit to find a and b
- f. Compare your calculated and measured values of a and b