

# **University of California, Los Angeles**

**School of Engineering and Applied Science**

**Department of Electrical and Computer Engineering**

**Name: <>**

**UID: <>**

**Experiment 3: Transient Response of the 1<sup>st</sup>-Order  
Circuits**

## **ECE11L Lab**

**Instructor: Sudhakar Pamarti**

## 1. RC Circuit Analysis

<Insert Waveforms Image showing the time-constant measurement (0 – 63.5%)>

<Make sure to show the cursor positions>

Theoretical Time constant	Experimental Time Constant

### Discussion

- How does the experimental time constant compare with the theoretical values?

<Answer in 1-2 lines. >

- How does the voltage response of the resistor differ from that of the capacitor?

<Answer in 1-2 lines.>

- How does zooming in time resolution (mS/div  $\rightarrow$   $\mu$ S/div) change the sampling rate and your measurements?

<Answer in 1-2 lines.>

- Explain what happened when you increased the frequency of the input.

<Answer in 1-2 lines.>

## 2. RL Circuit Analysis

<Insert Waveforms Image showing the time-constant measurement (0 – 63.5%)>

<Make sure to show the cursor positions>

- What is the inductor resistance?

$R_{\text{inductor}} =$

Theoretical Time constant	Experimental Time Constant

### Discussion

- How does the experimental time constant compare with the theoretical value?

<Answer in 1-2 lines. >

- When calculating the theoretical time constant of the RL circuit, should the resistance of the inductor be included?

<Answer in 1-2 lines.>

- How does the response of the RL circuit compare with the response of the RC circuit?

<Answer in 1-2 lines.>

### 3. DC Switching Analysis

<Insert Images of  $v_{C1}$ ,  $v_{R1}$ ,  $v_{R2}$  from Waveforms clearly zoomed in.>

	Theoretical Value (V)	Experimental Value (V)
$v_{C1}(0^-)$		
$v_{C1}(0^+)$		
$v_{C1}(\infty)$		
$v_{R1}(0^-)$		
$v_{R1}(0^+)$		
$v_{R1}(\infty)$		
$v_{R2}(0^-)$		
$v_{R2}(0^+)$		
$v_{R2}(\infty)$		

#### Discussion

- What did you observe of the voltage across the elements? Explain any behavior that strays from the ideal expectations.

<Answer in 2-3 lines.>

#### 4. First Order Circuit Design

<Insert Waveforms Image showing the time-constant measurement (0 – 63.5%)>

<Make sure to show the cursor positions>

Type of Circuit (RC/RL)	Resistance Value	Capacitance Value/Inductance Value	Theoretical Time constant	Experimental Time constant