EE340: Control Systems
Lab Manual

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Name: _____

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Important Instructions

- Every student should have lab manual in the lab; otherwise there will no evaluation and attendance

- Those students who have been given Laptop must have it in the lab

- Every student should fill his/her own manual in the lab, complete in all respects, otherwise there will be deduction of marks, and no excuse will be accepted

- Every student will have to submit simulation assignments in individual. Assignments after due date will not be accepted

- Every student must have text book in lab.

- There will be a term project and number of simulation/hardware assignments for this lab.

Part A

System Modeling

Experiment No. 1

System Modeling of R-C Circuit

Pre-Lab Reading

Chapter 1 of Katsuhiko Ogata, Modern Control Engineering, 5 th edition, Prentice Hall 2010.

Chapter 1 of N. S. Nise, Control Systems Engineering, 5 th edition, John Wiley Inc, 2009.

Objectives

- Understand system modeling.

- Understand system transfer function.

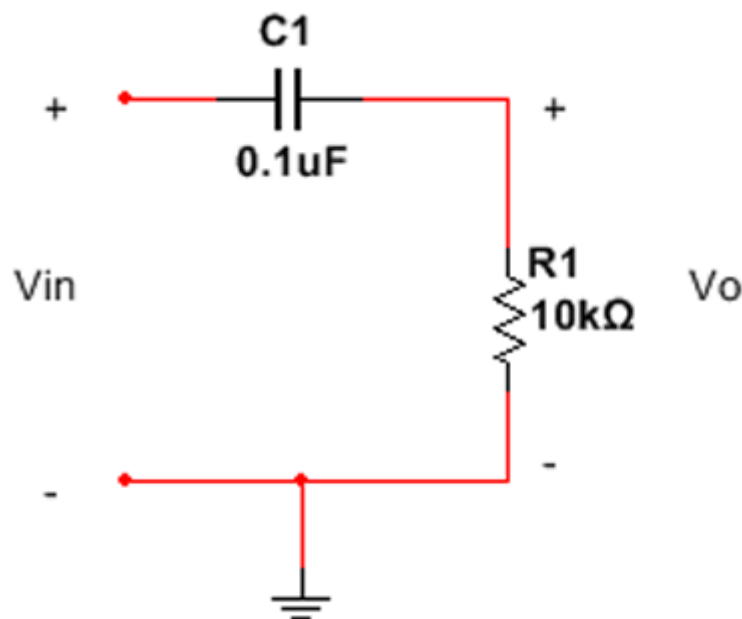- Observe behavior of system.

Circuit Diagram

FIGURE 1.1: RC Circuit

Section 1.1: Theoretical Calculations

- **Find Transfer function of system shown in Figure 1.1**

- **Find zero, pole and gain from Transfer function.**

- **Find differential equation of system.**

- **Find Unit step response of system.**

- **Fill table below.**

Observation Set:

No.	Time	V_o (dc)
1	1ms	
2	2ms	
3	3ms	
4	4ms	
5	5ms	
6	6ms	
7	7ms	
8	8ms	

Section 1.2: Simulation

- **Define Transfer function of system in Matlab.**

- **Find zero, pole and gain from Transfer function.**

- **Find Unit step response of system.**

- **Fill table below.**

Observation Set:

No.	Time	V_o (dc)
1	1ms	
2	2ms	
3	3ms	
4	4ms	
5	5ms	
6	6ms	
7	7ms	
8	8ms	

Matlab Functions:

No.	Code
1	tf
2	zpk
3	stepplot

Section 1.3: Hardware Results

- Patch Circuit on breadboard.

- Generate 50 Hz Square wave with Vp-p 1V and offset 0.5V and use as input.

- Observe output using Oscilloscope.

- Fill table below.

Observation Set:

No.	Time	V_o (dc)
1	1ms	
2	2ms	
3	3ms	
4	4ms	
5	5ms	
6	6ms	
7	7ms	
8	8ms	