ELEC 3004/7312: Signals Systems & Controls

Prac/Lab 4: ~~PID Control & Lead/Lag Compensators (using Op-Amps)~~
Digital Control Q&A

Laboratory Completion & Extra Credit Points

Laboratory Completion:
Please work **together** on the lab in groups of 2-3. Please submit an **individual** hand-in sheet. Treat the questions at the end as thought questions – questions that you should be able to answer, but not that you have to answer explicitly. Though you could be asked these during a tutor group review.

Tutor Group Review:
At various stages in the lab (or at the end) the tutors will come around to check progress. The **may** ask some questions to check your understanding. Each person in the group **may** get asked different questions at the tutor's discretion. Based on your answers they will mark (initial) your hand-in sheet. The tutors are just checking that you understand the core ideas of each Experiment and its Parts.

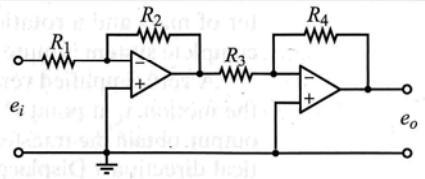
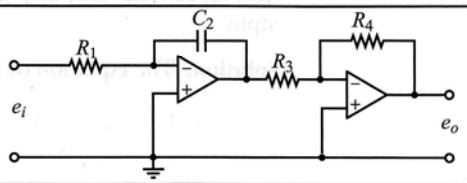
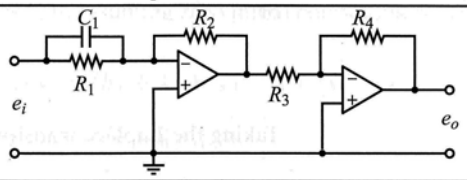
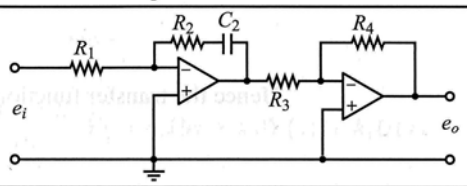
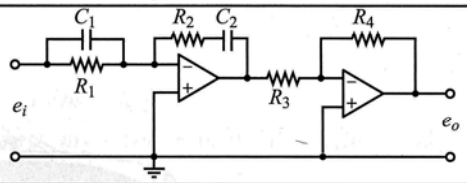
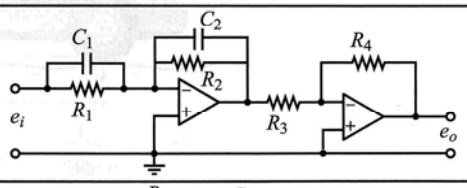
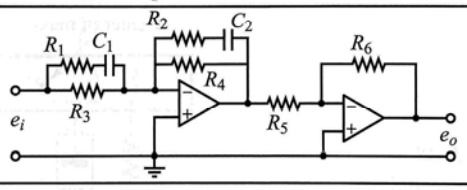
Extra Credit Points:
This practical laboratory is worth 1-4 Extra Credit Points on the final exam.
These will be distributed based on completion (as determined by the head tutor for your practical session) of the following sections at the end of the practical session.

Section Completed	Total Points Extra Credit Earned
Actively Participating	+ 1
Asking two or more detailed and relevant questions	+ 2
Answering two or more detailed & relevant questions	+ 3
Being chosen by the tutor to post a solution to the class (whiteboard/web/etc.)	+ 4

Experiment V: PID Control & Lead/Lag Compensators (using Op-Amps)

Introduction

This lab was supposed to be looking at PID control using continuous operational amplifiers (see also Table 3—1: Operational-Amplifier Circuits That May Be Used as Compensators, from Ogata *Modern Control Engineering*, page 95, copied below) and digital processors as used to model and control a miniature baby incubator (based on Australia Standard AS 3200.2.19-1992).

	Control Action	$G(s) = \frac{E_o(s)}{E_i(s)}$	Operational-Amplifier Circuits
1	P	$\frac{R_4}{R_3}\frac{R_2}{R_1}$	
2	I	$\frac{R_4}{R_3}\frac{1}{R_1C_2s}$	
3	PD	$\frac{R_4}{R_3}\frac{R_2}{R_1}(R_1C_1s+1)$	
4	PI	$\frac{R_4}{R_3}\frac{R_2}{R_1}\frac{R_2C_2s+1}{R_2C_2s}$	
5	PID	$\frac{R_4}{R_3}\frac{R_2}{R_1}\frac{(R_1C_1s+1)(R_2C_2s+1)}{R_2C_2s}$	
6	Lead or lag	$\frac{R_4}{R_3}\frac{R_2}{R_1}\frac{R_1C_1s+1}{R_2C_2s+1}$	
7	Lag–lead	$\frac{R_6}{R_5}\frac{R_4}{R_3}\frac{[(R_1+R_3)C_1s+1](R_2C_2s+1)}{(R_1C_1s+1)[(R_2+R_4)C_2s+1]}$	

Instead, the lab session has been dedicated to answering general digital controls questions.

Experiment IV:
Digital Control Q&A

Hand-In Sheet

Name: _____
Student ID: _____
Date: _____

Group Name/Members: _____
_____

Part Completed	✓ (Tutor)
Actively Participating: Did you actively participate in this session?	
Asking two or more detailed and relevant questions: What are the specific, detailed questions you have on Digital Controls	

Answering two or more detailed & relevant questions: What were the specific and detailed questions you answered? Briefly, what was your answer?	
Were you chosen by the tutor to post a solution to the class (whiteboard/web/etc.)?	

Total Extra Credit Awarded: _____

Tutor Sign-Off: _____