

## ECE317 Lab 5 (modification) – Spring 2023

Lab 5 involves the analysis and performance evaluation of primarily an integral compensator used in a closed loop configuration. With the new PCB, the performance of the proportional and lead compensated configurations may also be easily examined and compared with their PECS simulations. Please read this document along with the original Lab 5 document.

The integral compensator only requires one 100k resistor and a 22nF capacitor (referenced as REF1 and REF3 in the schematic below) to be connected to the CA3140 op amp. (Other components can also be connected to implement the other compensators as well as the one used in Lab 6. These components are referred to as REF2, REF4, REF5 and REF6).

In the following, to explain switch positions we will orient the board so that looking at the populated PCB from above, the power supply connectors are on the left. We can proceed as follows for this lab (Lab 5):

- i) Make sure your open loop configuration is in working condition before you close the loop, as it is much simpler to troubleshoot an open loop circuit, if need be. For the open loop configuration, you should have:
  - a) the two slider switches SW1 should be in the left positions,
  - b) the slider of switch SW2 should be in the left position,
  - c) OC/CL jumper connection open.
- ii) Once you're sure that the open loop configuration is working you can proceed (with the power off) to close the loop by:
  - a) moving the sliders of switches SW1 and SW2 to the right positions, and,
  - b) having the OC/CL jumper connection closed.

In this modified Lab 5, a limited set of tasks (compared to the original Lab 5) will be undertaken:

- i) Matlab determination of loop gain: Task 2(a) from the original Lab 5.
- ii) Time domain responses using Matlab: Tasks 3(a) and 3(b), from the original Lab 5.
- iii) Time domain responses using PECS: Tasks 4(a) and 4(b), from the original Lab 5.
- iv) Time domain response from the prototype: Tasks 5(a) and 5(b), from the original Lab 5.
- v) Tabulation of results: Task 6, from the original Lab 5. (No need to provide the stability margin results from asymptotic plots).
- vi) The final tasks to be undertaken is to obtain PECS simulation plots as well as oscillogram screen shots of the step load response for both the proportional and lead compensator configurations. (The compensator component values are provided in the Lab writeup). In your report, provide the following:
  - a) the two complete PECS schematics, (one for the proportional controller and the other for the lead controller)
  - b) the two PECS simulation plots,
  - c) the two oscillogram screen shots showing the prototype responses.

Be sure to include in your report the plots of all the time domain responses asked for in the above tasks and the Matlab code used in (i) and (ii).



