EEE 148 Lab Exercise 8

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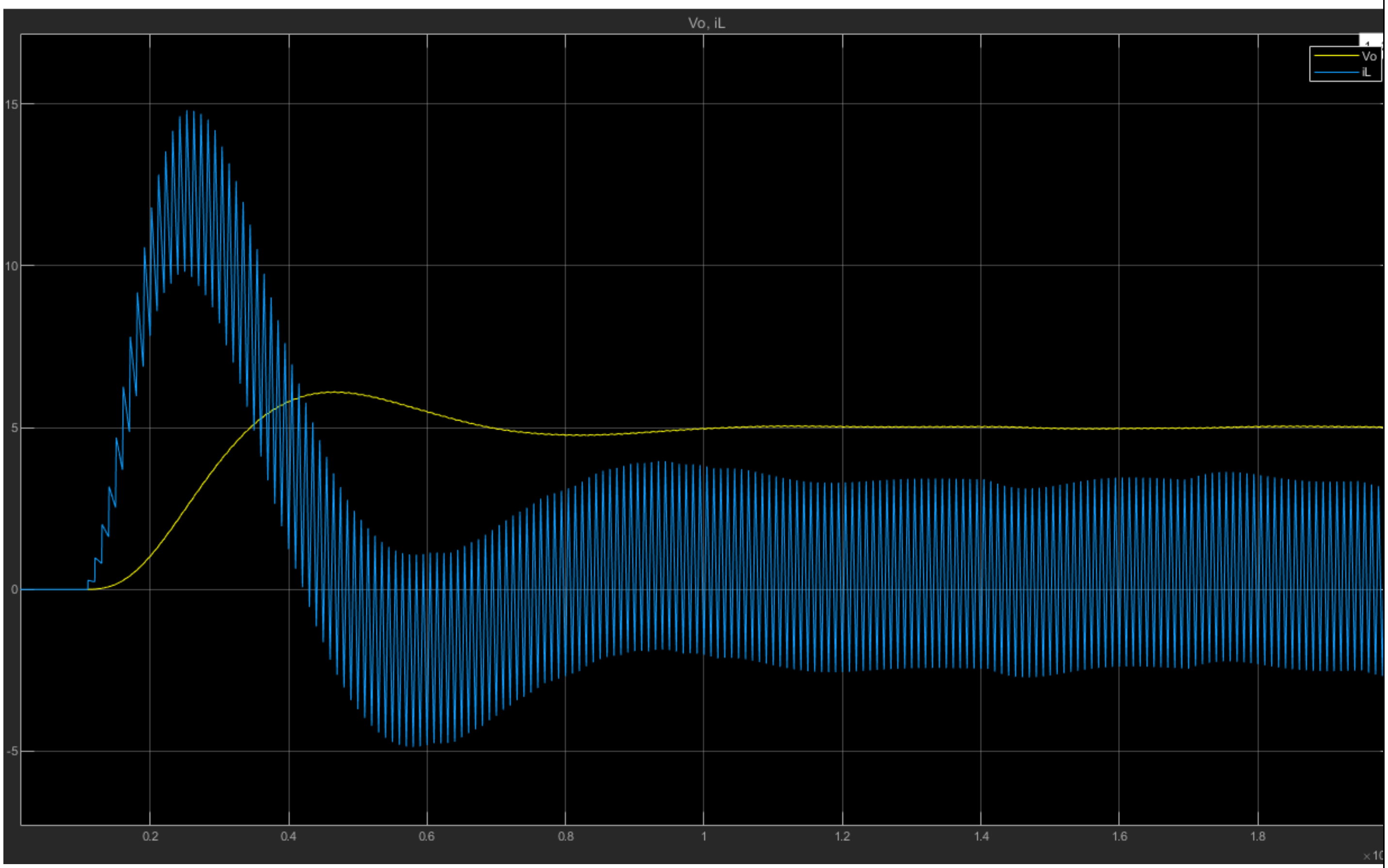
Collaborated with:		

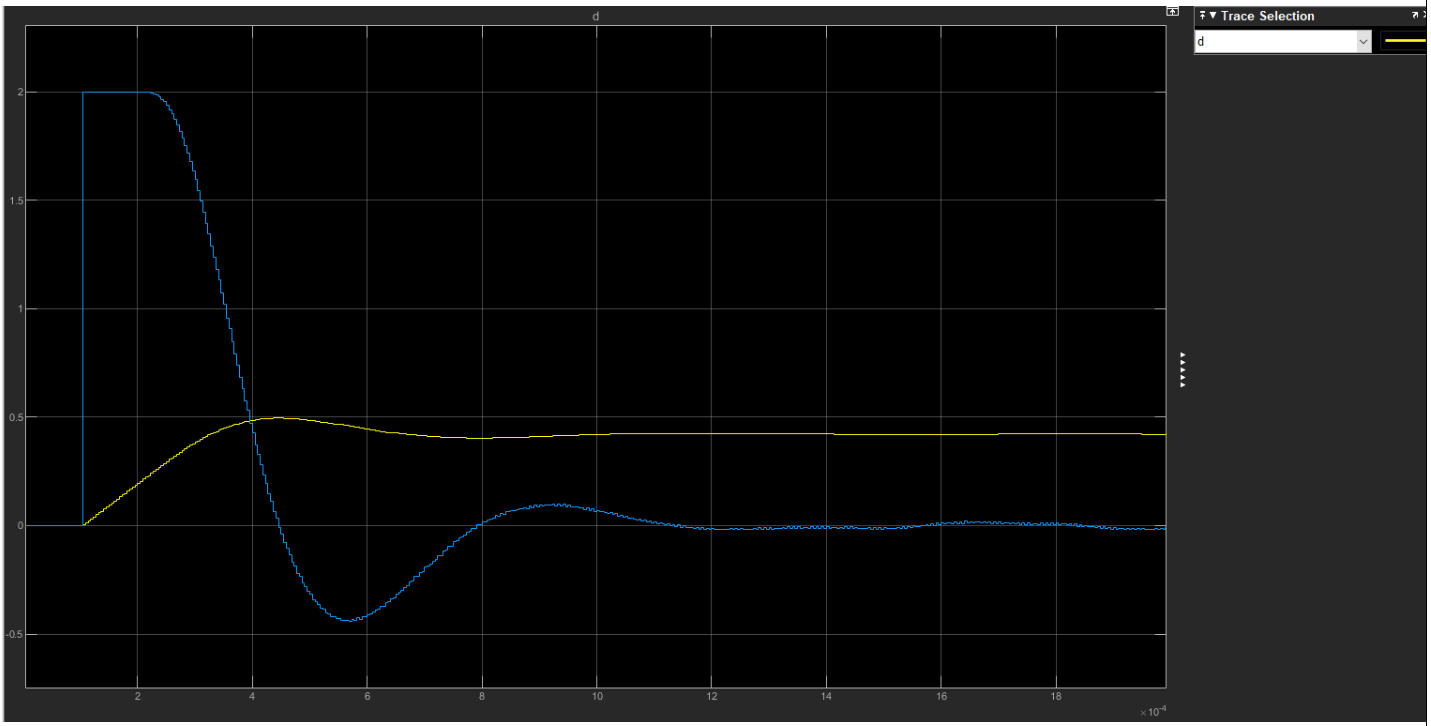
GENERAL INSTRUCTIONS: Provide the required information in the spaces provided. If you run out of room for your answers, feel free to adjust the template as necessary.

3. Run the simulation for 0.01s. Observe plots for V_o, I_L, $V_{compensator}$, and V_{DPWM}. Capture the plot within 0.002s.

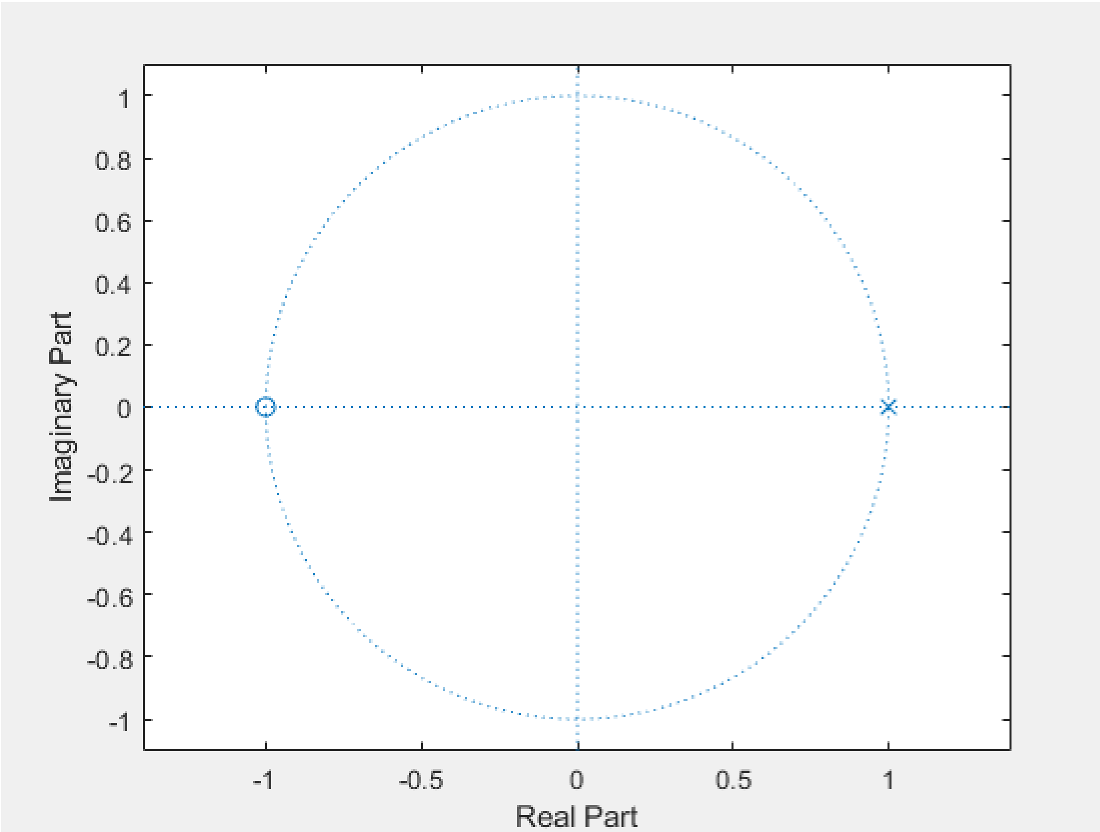
V_o, I_L *Plots*



$V_{DPWN}, V_{compensator}$



4. Determine the location of the poles and zeros of your digital compensator.



The pole is at 1, the zero is at -1.

5. Is the system stable? Justify.

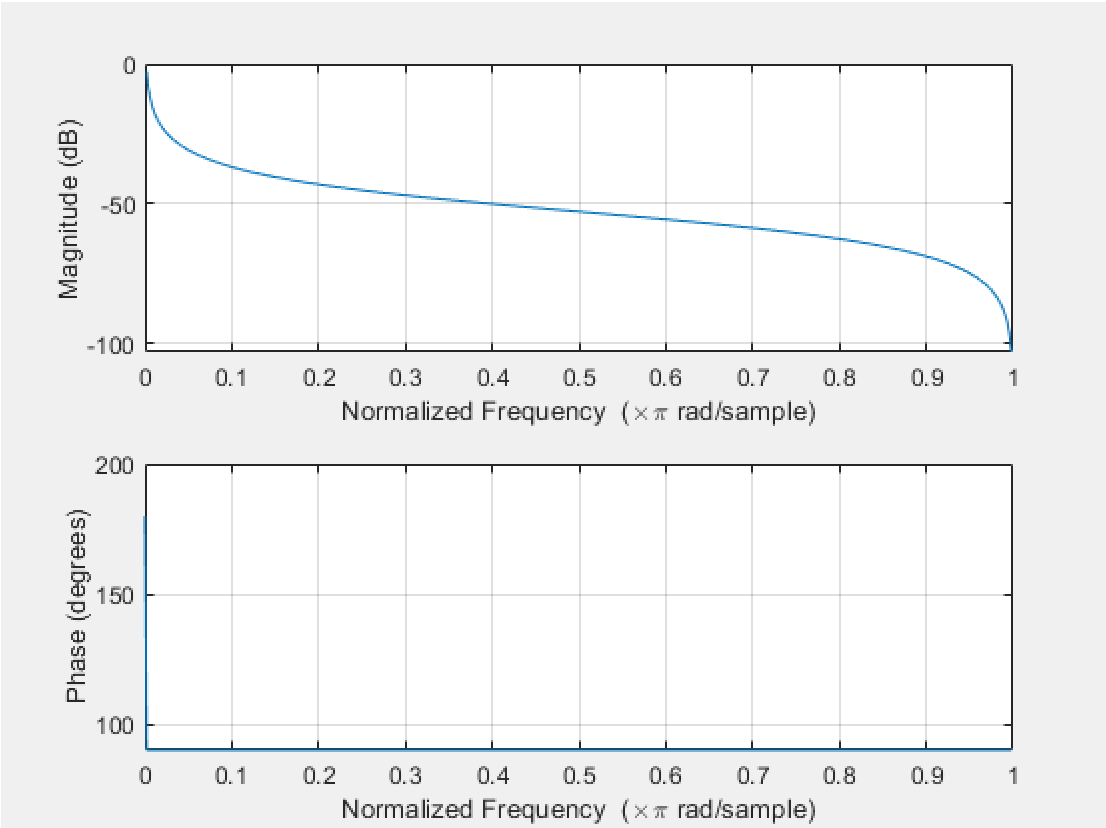
Stable? [YES/NO]:

Yes, the system is **Marginally Stable.**

Why?

For an input with a finite magnitude, the output will not blow up, but it will also not go back to zero as well. This is based on the plot shown above. Having a pole at the border of the unit circle will yield a marginally stable system. Having a pole inside gives us a stable system. A pole outside

6. Determine the magnitude and phase response of your digital compensator.



7. Try to lower the value of K to make the system more stable. At what value of K where you able to produce a V_o steady state value of more or less 5V?

$$\boldsymbol{K} = 0.999$$

Having K = 0.999 gives us a steady state V_o of more or less 5V. This makes the system stable since it moves the pole inside the unit circle.

8. Using your value of K in 7), determine the discrete-time transfer function $H_{stable}(z)$. *Hint: No BLT is required for this step, just refer to the difference equation given in Equation 2.*

$$H_{stable}(z) = -\frac{T}{2\tau_i}\frac{1+z^{-1}}{1-Kz^{-1}}$$

$$H_{stable}(z) = -\frac{T}{2\tau_i}\frac{1+z^{-1}}{1-0.999z^{-1}}$$

Submission Policy:

- Submit this answer sheet in PDF format, modified Simulink simulation file, and MATLAB scripts used if any.
- Follow the filename **eee148lab8_studentnumber**, i.e. eee148lab8_202012345.pdf or eee148lab8_202012345.slx.
- Do not zip your submissions.