

*Your Name*

Practical Filter Design & Implementation Lab

*Date Completed*

## PRELAB

1. Use the CHEB2ORD function in MATLAB to determine the order (N) and the natural frequency ( $\omega_n$ ) of the bandpass filter that meets the given specifications. Write these below.
2. Use the CHEBY2 function in MATLAB to solve for the transfer function of the filter. Write the transfer function below.
3. Use MATLAB to generate the Bode plot for the filter and paste a copy below.
4. Use MATLAB to plot the impulse response for the filter and paste a copy below.
5. Use MATLAB to plot the step response for the filter and paste a copy below.
6. Write the poles and zeros of your transfer function below.

## LAB

7. List the zeros, poles, and Q's for each stage of the filter below.
8. Write the transfer function for each stage of the filter below.
9. Generate the Bode plot for each stage on a single plot and paste it below.
10. Generate the impulse response of each stage on a single plot and paste it below.
11. Generate the step response of each stage on a single plot and paste it below.
12. Insert a table listing each component along with the value calculated for the component, and the actual values used for each component.
13. Using the circuit component values that you chose, calculate the overall transfer function and list it below.
14. Paste a copy of the Bode plot using the real component values that you selected below.
15. How does the combined function Bode plot compare with the plot from question 3?
16. Paste a plot of the magnitude of the output vs frequency (amplitude vs frequency in Hz) for each stage and the completed circuit, in one plot.
17. Paste a plot of the magnitude of the output vs frequency (dB vs log of the frequency in rad/s) for each stage, and the completed circuit, in one plot.
18. How does each stage compare with the results from Matlab?
19. Why is it beneficial to test each stage individually?
20. How do the impulse and step responses of the circuit compare with the MATLAB results from questions 4-5?
21. Paste a picture of the impulse and step responses from your oscilloscope below.

22. Audibly, does the filter work as you would expect? What range of frequencies could you clearly hear?
23. Does the filter meet the specifications you were given? If not, how might the filter be improved upon in order to meet them?