Note: Due to the proximity of the midterm to the due date; there will be no extensions on this homework.

Problem 1 *Bode Form* 10 points

Convert the following transfer function to Bode form:

$$G(s) = \frac{2000\,(s+0.5)}{s\,(s+10)\,(s+50)}$$

Problem 2 *Second order system form* 10 points

Find the value of ω_n and ζ for the respirator-airway system in Example 6.7 of CSSB.

$$\frac{Q(\omega)}{P(\omega)} = \frac{9.52j\omega(1+0.0024j\omega)}{1-0.00025\omega^2+0.155j\omega}\,\frac{\text{L/min}}{\text{mmHg}}$$

This is Problem 6.22 of CSSB.

Problem 3 *Inverse Bode Plot* 20 points

Estimate the transfer function represented by the plot below. Then plot the magnitude and phase of your estimated transfer function using software/toolboxes and verify your guess.

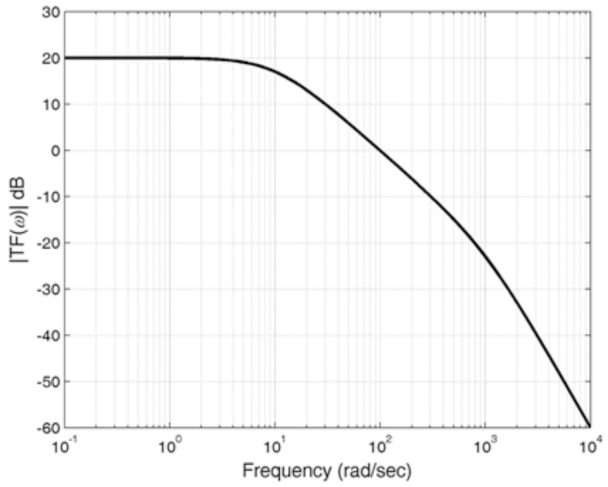

Figure 1: Estimate the transfer function.

Problem 4 *Bode Plot 1* 20 points

Use graphical techniques to plot the magnitude and phase of the following transfer function

$$G(\omega) = \frac{100\,(1+0.05j\omega)}{1+0.01j\omega}$$

This is Problem 6.14 of CSSB.

Problem 5 *Bode Plot 2* 20 points

Use graphical techniques to plot the magnitude and phase of the following transfer function

$$G(\omega) = \frac{10j\omega}{1 - 0.0001\omega^2 + 0.002j\omega}$$

This is Problem 6.16 of CSSB.

Problem 6 *Really can't escape MATLAB* 20 points

(a) (5 points) Use MATLAB to verify your work for Problem 3 above.
(b) (5 points) Use MATLAB to verify your work for Problem 4 above.
(c) (10 points) Use MATLAB to create Bode plot for the transfer function:

$$G(s) = \frac{0.01\left(s^2 + 0.01s + 1\right)}{s^2\left(\frac{s^2}{64} + 0.02\frac{s}{8} + 1\right)}$$

Note: Lest there be complaints, parts (a) and (b) are Problem 6.18 of CSSB.