EE341.01 **PS12** **DUE W 12/10/97**

Consider the brushed-dc motor discussed in class with the following specifications:

K_T	=	4.07 oz•in/A
L	=	1.56 mH
J	=	5.9×10^{-4} oz•in•s^2
R	=	1.89 Ω
β	=	6.68 oz•in/krpm
K_b	=	3.01 V/krpm

1. Find the transfer function $H(s) = \Omega(s)/V_a(s)$ for the motor values given.

2. Plot the magnitude and phase of $H(\omega)$.

3. Discuss how the motor will respond to input voltages at various frequencies. At what frequency will the motor effectively cease to respond to the input voltage.

4. Plot a pole-zero diagram for H(s) and discuss the motor's stability.

5. Find h(t). Does h(t) support your stability conclusions found above?

6. Plot $\omega(t)$ in krpm for $V_a(t) = 15u(t)$ V. Verify that $\omega(t)$ approaches the final value expected by using the Final Value Theorem.

7. Find a square wave input voltage $V_a(t)$ of period T = 0.2ms that will yield the same steady-state (final) velocity as the step input above. Sketch $V_a(t)$ and write the first three terms in the trigonometric Fourier Series representation of $V_a(t)$ as well as $\omega(t)$.