CHAPTER 2
1. Given a "rotational" mechanical system find the requested transfer function.

2. For a voltage controlled DC motor, find $K_t$, $K_t/R_a$, and $K_b$ given the torque-speed plot and find $\theta_M(s)/E_a(s)$ and/or $\theta_L(s)/E_a(s)$.

CHAPTER 3
1. Given an electromechanical system or a closed-loop transfer function, represent the system in phase variable state-space form.

2. Find the closed-loop transfer function, $G_{CL}(s)$, given any state-equation and output equation that model the system.

CHAPTER 4
1. Given the transfer function of a first-order system or a plot of the output response for a step-input, find its $\tau$, time constant, $T_r$, rise time, and $T_s$, settling time as a result of a step-input of any magnitude.

2. Given a 2nd-order system or a system that can be approximated as a 2nd-order system (dominant poles), find $\zeta$, damping ratio, $\sigma_d$ real part of the poles, $\omega_d$, damped frequency, $\omega_n$, natural frequency, $T_s$, settling time, $T_p$, peak time, and %OS for a step-input. If given a plot of the response for a step-input, estimate the foregoing and $T_r$, the rise time. Given the desired %OS and/or $T_s$ and/or $T_p$ specify the desired 2nd-order Closed-Loop Transfer function. Estimate the 2nd order transfer function from an output response plot.

3. Make a rough sketch of the output-response of a given transfer function that has extra poles and zeros as compared to a second-order system.

4. Explain and sketch how you would move the poles of a given closed-loop transfer function to obtain the desired transient and Settling Time.

5. Determine if a system can be approximated as a 2nd-order system. Explain how you arrived at you conclusion.

6. Find the eigenvalues of the given system.

7. Find $y(s)$ given a system in state-space form without first finding its transfer function.

CHAPTER 5
1. Convert Block diagrams to Signal-Flow-Graph (SFG) form.

2. Convert the state equation and output equation to SFG form.

3. Find the system transfer function, $C(s)/R(s)$, from a given SFG or one found from 1 or 2 using Mason’s Rule.

4. Given a system described in Block diagram form, find the system transfer function, $C(s)/R(s)$.

5. Determine the gain, $K$, of a closed-loop system that will produce a desired percent overshoot.

Study the Homework Problems of Chapters 2, 3, 4, and 5.