

ENGR 511
Spring 2024 Midterm Study Guide

Objective:

To provide a semester midterm summary test to determine mastery and knowledge gaps for the student and to provide a means for the instructor to address the gaps.

Overview of Topics:

1. Control System Basics
 - a. 10 questions about control systems terminology and subject matter
 - i. Example: What is an open and closed loop system and what are the advantages and disadvantages of each.
 - b. What are the response characteristics of a control system
 - i. Response and settling times, Overshoot, steady state, error.
2. Control Systems Mathematics
 - a. A series of time and frequency functions to show your ability to use Laplace Transforms (and inverse Laplace) to go from time to frequency domains
 - i. Know how to do partial fractions
 - b. Know how to take the complex conjugate
3. System Response
 - a. Demonstrate how to obtain a transfer function
 - i. Some circuits will be presented for your analysis
 - b. What is the transfer function order, poles, and zeros
4. System Response Behavior
 - a. Demonstrate your knowledge of the initial and final value theorems
 - i. A transfer function will be provided for analysis
5. General Forms of Transfer Functions
 - a. Determine the time constant from the transfer function
 - b. What is the DC Gain
 - c. What is the system Gain
6. Bode Plots
 - a. Analyze a simple circuit and draw out a **Bode Plot** approximation (non-Log).
 - b. Discuss low and high frequency conditions and the cutoff frequency at 0.707 max amplitude
7. Stability
 - a. Determine if a system is stable using the Routh-Hurwitz criteria
8. BONUS: Sensitivity
 - a. What is the sensitivity of a system with specific parameters provided.