

ECE 601 Linear Systems

Homework #9

Due Date: December 6, 2025 (Saturday after final class)

1. Kailath Problem 4.1-7
2. Kailath Problem 4.2-4
3. **CO Compensator for the Spring-Electromagnetic System:** Reconsider the controller for the spring-electromagnetic system in Homework #8. This design assumed full state knowledge. But since it was shown in Homework #6 that this system is observable, it should be possible to relax this assumption by using an observer.
 - (a) Build an observer for this system. Explain each step of your design process. Simulate your controller-observer compensator using the linear model of the system. Initialize the observer with zero initial conditions, and assume the true initial conditions are nonzero. Does the system behave as expected? Explain.
 - (b) Test your design by simulation using the nonlinear model. Does it work as expected? Explain.