

EE380K: Linear Systems Theory—Fall 2008

PROBLEM SET 7

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Due **Wednesday**, November 5, 2008.

This problem set focuses on the ideas of reachability/controllability, and observability, and modal interpretations of each. In particular, this problem set covers the Kalman decomposition, which we only briefly discussed in class. This is covered in the notes, and you should know it!

1. Exercise 24.2 from the course notes.
2. Exercise 24.4 from the course notes.
3. Exercise 24.5 from the course notes.
4. Fill in the details to the proof of the Kalman decomposition. In particular, show that:
 - (a) The matrices \hat{A} , \hat{B} , and \hat{C} have the indicated form.
 - (b) The subsystem $(A_{ro}, B_{ro}, C_{ro}, D)$ is both reachable and observable.
 - (c) The Kalman decomposition is unique up to similarity transformation.
 - (d) The transfer function of this subsystem is equal to the transfer function of the full system.
- * We have discussed the Laplace transform, and transfer functions. Read Chapter 25, and do the following exercises. **You do not need to turn these in.**
5. Exercise 25.2 from the course notes.
6. Exercise 25.5 from the course notes.
7. Exercise 25.6 from the course notes.