332: 506 FINAL PROJECT — Control Theory II — Fall 2002

Take a linear time invariant system presented in its state space form. Use MATLAB and SIMULINK to solve the following control/filtering problems:

1) System order reduction via balancing. Compare the step and impulse responses of the original and reduced systems. If the chosen system is a SISO system compare also the corresponding frequency transfer functions.

2) Design an observer with appropriately chosen observer gain. Plot the actual and observed state space variables.

3) Design the reduced order observer via the Sylvester equation. Plot the actual and observed state space variables.

4) Solve the zero-set point linear-quadratic regulator. If the weighed matrices are not give choose them as identities.

5) Simulate nonzero set-point response obtain via the use of the optimal linear-quadratic regulator.

6) Simulate the response of the system under constant disturbance using the linear-quadratic regulator theory.

7) Simulate the observer-based solution to the general H_2 optimization problem.

8) Simulate the observer-based solution to the general H_∞ optimization problem.

9) Design the H_∞ filter. Assuming that the weights are equal to identity.

Solve any six out of nine problems.