

ECE504 Homework Assignment Number 9
Due by 8:45pm on 01-Dec-2009

Tips: Make sure your reasoning and work are clear to receive full credit for each problem.

1. 6 pts. Given the proper rational SISO transfer function

$$\hat{g}(s) = \frac{s}{s^2 - 1}$$

- (a) Find a minimal realization.
- (b) Find a realization that is observable but not reachable/controllable.
- (c) Find a realization that is reachable/controllable but not observable.

2. 3 pts. For the system with transfer function matrix

$$\hat{G}(s) = \begin{bmatrix} \frac{s+1}{s+2} & \frac{1}{s+3} \\ \frac{s}{s+1} & \frac{s+1}{s+2} \end{bmatrix}$$

determine the McMillan degree of $\hat{G}(s)$ and find a *minimal* realization $\{\mathbf{A}, \mathbf{B}, \mathbf{C}, \mathbf{D}\}$ for this system. You may want to verify your results with Matlab function `minreal`.

- 3. 3 pts. Chen 8.6.
- 4. 3 pts. Chen 8.8.