

ECE504 Homework Assignment Number 6  
Due by 8:45pm on 03-Nov-2009

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

1. 3 pts. Chen 5.10 (note that Chen's "marginally stable" is our "stable").
2. 3 pts. Chen 5.13.
3. 3 pts. Chen 5.18.
4. 3 pts. Chen 5.23.
5. 3 pts. Recall the CT-LTI Lyapunov equation:  $\mathbf{A}^\top \mathbf{P} + \mathbf{P} \mathbf{A} = -\mathbf{Q}$ .
  - (a) Suppose  $\mathbf{A}$  is a diagonal matrix. Find an explicit analytical solution to the Lyapunov equation, i.e., find an expression for the entries of  $\mathbf{P}$  in terms of the entries of  $\mathbf{A}$  and  $\mathbf{Q}$ .
  - (b) Now suppose that  $\mathbf{A}$  is diagonalizable. Find an expression for  $\mathbf{P}$  in terms of the eigenvalues and eigenvectors of  $\mathbf{A}$ .