ENME 621
ROBUST AND ADAPTIVE LINEAR CONTROL — Prof. M. Krstic

MIDTERM EXAM: Robust Control

November 2, 1995

Open books and notes. Total points: 25. Time 3:30–4:50.

1. (13 points)
   Problem 6.16, Part 2, in *Green & Limebeer*. In addition, show that the controller $u = -B_2' Px$ achieves a better 2-norm attenuation with $\gamma = \infty$ in (6.3.5) (LQG controller) than with *any* $\gamma < \infty$ ($\mathcal{H}_\infty$ controller).

2. (12 points)
   Consider the mass-spring system in Section 8.4 in *Green & Limebeer*, where a controller was designed to guarantee that the $\mathcal{H}_\infty$ norm from $(\dot{\Theta}_K, L)$ to (e, y) (notation from the class notes) is no greater than $\gamma_{\text{opt}} = 3.8856$. Suppose that the drive motor with gain 40 has been replaced with a motor with gain A, but the controller has *not* been changed. Determine a range of A for which the closed-loop system remains internally stable. Is it stable for $A = 50$ and why/why not?