

University of Massachusetts Lowell
Department of Electrical and Computer Engineering

16.413 Linear Feedback

Problem set 7

1. Using the state function of Pontryagin determine the optimal input u that minimizes

$$V = \int_0^1 \frac{u^2 + x^2}{2} dt$$

subject to the constraint

$$dx/dt = 7x + u$$

The solution must yield $x(0) = 1/2$ and $x(1) = 1$.

2. Using Hamilton Jacobi approach determine the input u in terms of x_1 and x_2 such that

$$V = \int_0^{\infty} x_1^2 + x_2^2 + u^2 dt$$

is minimized subject to the constraint

$$\begin{bmatrix} x'_1 \\ x'_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 2 \end{bmatrix} u$$