

- When turn in your homework, please write down: 作業次別, 姓名, 學號, 系級, 日期
 - Assigned: 12/25/07, Due on 1/8/08
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- (State Feedback and State Estimation)

- 1 (A RLRC circuit)

20 points

- Consider the RLRC circuit discussed in Problem 1 of HW1 and assume that $\mathbf{A}, \mathbf{B}, \mathbf{C}, \mathbf{D}$ of the state-space model is given in the following.

$$\mathbf{A} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} \frac{1}{L} \\ 0 \end{bmatrix}, \quad \mathbf{C} = [0 \quad 1], \quad \mathbf{D} = 0$$

where $a = -R_1/L, b = -1/L, c = 1/C, d = -1/CR_2$. Assume that we would like to use **state feedback** to move the poles or adjust the sensitivity of the system, but we cannot gain access to measure the state variables. (Perhaps the circuit is modeling something sealed inside a container.) Please design a **stable estimator** and use its state variables for feedback control. Assume that the estimator gain is $\mathbf{L} = [l_1, l_2]^T$ and find the feasible range of the values of l_1, l_2 , such that the estimator is **stable**.