ECE 486: Control Systems — Assignment # 06

Issued: Dec 21 — Due: Dec 28, 2023

Question 1

With an example, discuss the benefits of using state-space control design. (4 Points)

Question 2

Consider a system $\dot{\mathbf{x}} = \mathbf{A}\mathbf{x} + \mathbf{B}u;\ \mathbf{y} = \mathbf{C}\mathbf{x}$

where, $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -1 & -2 \end{bmatrix}; B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}; C = [1 \quad 1 \quad 0]$

Write down a transfer function representation of the system. (4 Points)

Question 3

Consider the system:

$$\dot{x} = \begin{pmatrix} 0 & 0 & a_3 \\ 1 & 0 & a_2 \\ 0 & 1 & a_1 \end{pmatrix} x + \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} u \ ; \ y = (0 \quad 0 \quad 1)x$$

(a) Are there real values for a_1, a_2, a_3 that make the system non controllable? (6 Points)

(b) Are there real values for a_1, a_2, a_3 that make the system non observable? (6 Points)