Homework #7
ME EN 5210/6210 & CH EN 5203/6203 & ECE 5652/6652
Linear Systems & State-Space Control

Use this page as the cover page on your assignment, submitted as a single pdf.

Problem 1

For the transfer matrix shown below, find a state-space realization using the two techniques from Chapter 4 that we learned in class. For part (a), use the method that puts every element over a common denominator. For part (b), use the method that only puts elements in the same column over a common denominator. Make note of the difference in the number of states that results from the different methods.

$$G(s) = \begin{bmatrix} \frac{2}{s+1} & \frac{2s-3}{(s+1)(s+2)} \\ \frac{s-2}{s+1} & \frac{s}{s+2} \end{bmatrix}$$

Problem 2

For each of the following continuous transfer functions, determine if the system is BIBO stable. Provide the rationale for your answer. Use MATLAB for root solving.

(a) $G(s) = \frac{10}{s^2+7s+12}$
(b) $G(s) = \frac{s-5}{s^2+7s+12}$
(c) $G(s) = \frac{10}{s^3+7s^2+12s}$
(d) $G(s) = \frac{10}{s^2+s-12}$

Problem 3

For each of the following discrete transfer functions, determine if the system is BIBO stable. Provide the rationale for your answer. Use MATLAB for root solving.

(a) $G(z) = \frac{10}{z^2-0.25}$
(b) $G(z) = \frac{z+2}{z^2-0.25}$
(c) $G(z) = \frac{10}{z^2+0.25}$
(d) $G(z) = \frac{10}{z^2+1.5z-1}$
(e) $G(z) = \frac{10}{z^3+z^2-0.25z-0.25}$

Problem 4

For each of the following impulse responses, determine if a system that has such an impulse response is BIBO stable.

(a) $g(t) = \frac{1}{t+1}$
(b) $g(t) = te^{-t}$