UC Berkeley

EE128 Homework #8

Due on 11/12/04 (Friday at 5PM in 497 Cory because of Veteran's Day Holiday)

(1) Textbook problem 7.1 (e)

(2) Give the observer canonical form for the following transfer function:

$$\frac{s^3 + 6s^2 + 7s + 3}{(s+2)(s^2 + 3s + 1)}$$

(3) Textbook problem 7.13

(4.a) For the system defined in problem 7.13, find the transition matrix of the system.
(4.b) If x(3)=[1 2], find x(5).

(5.a) Diagonalize the system in problem 7.13.
(5.b) Find the transition matrix of this diagonalized system.
(5.c) What is the state value of the diagonalized system that corresponds to the state x = [1 2] w.r.t the original coordinate system?

(6) Textbook problem 7.15 (a)

(7) In Monday's class, someone asked if we can always use the input u to steer the state to a given state (x1, x2) and keep the state there from that point on.

Find the condition on A and b such that for ANY INIITIAL condition Xo, we can keep X(t)=Xo.
******* This problem has changed *********

Hint: This has something to do with the range space of a matrix and when the state vector is constant, $\dot{x}$ = 0. (Find your linear algebra book for definition of range space. I won't give you problem like this in your final exam.)

As in the lecture, I use A, b, c, d for linear state equation.

$$\dot{x} = Ax + bu$$
$$y = cx + du$$