

ENEE 610

To do #4

Problem 3

Khadijeh Vahdat

John Rzesca

Date: 10/27/2010

$$a) T(s) = \frac{2s+10}{s^2+3s+7} \rightarrow \frac{b_1s+b_0}{a_2s^2+a_1s+a_0} \rightarrow b_1=2 \quad b_0=10 \\ \rightarrow a_2=1 \quad a_1=3 \quad a_0=7$$

$$\dot{x}(t) = Ax + Bu$$

$$U(s) = D(s)X(s) \rightarrow \dot{x}(t) = \frac{-1}{a_n} [a_0x_1(t) + a_1x_2(t) + \dots + a_{n-1}x_n(t)] + \frac{1}{a_n} u(t)$$

$$y(s) = N(s)X(s) \rightarrow y(t) = b_0x_1(t) + b_1x_2(t) + \dots + b_mx_{m+1}(t)$$

$$y(t) = Cx(t)$$

In this Problem $n=2$ and $m=1$

$$\therefore \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -7 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t) \quad y(t) = \begin{bmatrix} 10 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$b) T(s) = \frac{s^4+2s+10}{s^2+5s+6} \rightarrow b_4=1 \quad b_3=0 \quad b_2=0 \quad b_1=2 \quad b_0=10 \\ \rightarrow a_2=1 \quad a_1=5 \quad a_0=6$$

$n=2$ and $m=4$

$$\therefore \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 10 & 2 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$