File: G:/coursesF10/610/610F10Todo4.doc RWN 10/12/09 correction 10/26/10

610 Fall 2010 – To do #4

1. [L-R properties]

Using the partial fraction expansion for the first Foster reactance function derive the partial fraction expansion of the impedance z(s) for a passive inductor – resistor circuit. From that give properties of the poles and zeros of z(s) and y(s) and the even part zeros of z(s). Relate the even part zeros of z(s) to those of y(s).

2. [2-element kind synthesis]

Show that each of the following admittances is pr and synthesize each by 5 different methods and compare.

a) $y(s) = \dfrac{(s+4)(s+6)}{(s+5)}$

b) $y(s) = \dfrac{(s+5)}{(s+4)(s+6)}$

3. [Transfer function realizations] (3d in a) corrected to 3s)

Create semistate equations, Edx/dt=Ax + Bu, y = Cx, for each of the following transfer functions

a) $T(s) = \dfrac{2s+10}{s^2+3s+7}$ {choose x to be a 2-vector state}

b) $T(s) = \dfrac{s^4+2s+10}{s^2+5s+6}$

4. [Circuits for transfer functions]

Consider the transfer functions in problem 3 to be voltage to voltage ones, that is, $u=v_{in}$, $y=v_{out}$. For each T(s) create a circuit, possibly active, to yield T(s).

5. [Time domain]

For each of the transfer functions of problem 3 give

a) The impulse response
b) The unit step response
c) The response due to initial conditions on the “finite” states when u=0.

6. {extra}[Transformation of x for equivalent circuits]

For the a) transfer function of problem 3, show the effect on the circuit of putting a transformation K on the state, i.e. let X = Kx [here K is 2x2]