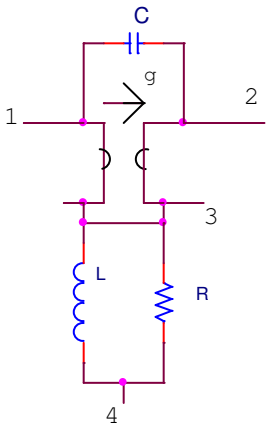
File: G:/coursesF12/610/610F12Hmwk4.doc RWN 09/23/12

610 Fall 2012 – Homework 4

1. For the following circuit
   a) Give the indefinite admittance matrix Yind(s).
   b) Ground node 4 and eliminate node 3 to give the 2-port Y(s); obtain $Z(s)=Y(s)^{-1}$



2. For the result of Problem 1, evaluate the even part of Y(s) and the even part of Z(s), compare, and discuss the even part zeros in terms of G=1/R
3. Using the 2-port Y(s) of problem 1, set C=G=0 and
   a. Find the load impedance $z_L(s)$ in terms of the input impedance z(s).
   b. Equate with the Richards function of the text and discuss the possibility for lossless synthesis.
4. The following 2-port circuit has the input port at nodes 1-5 and the output at nodes 2-5.
   a. Give the transfer function $T(s)=V_{2\text{-}5}(s)/V_{1\text{-}5}(s)$ when fed by a voltage source and having an open-circuit load.
   b. Discuss why we know there is at least one real pole or zero.
   c. Assume C4=C5=C and R1=R2=R, normalize L = R = C = gm = 1. Give the normalized T(s) and find the poles and zeros.
   d. Give the unit step response and the impulse response of the normalized circuit.