

610 Fall 2014 – Homework 4 Due Th 10/02/14

1. (50 points, degree one design)

For the admittance $y(s)=[as+b]/[s+c]$ use the Richards' sections of class (gyrator-capacitor in parallel) to give a design for all real and positive a, b, c . Discuss what happens when $a=0$ and/or $c=0$ and what will happen if $a=-b=c=-1$ as well as $a=-b=-c=-1$.

2. (50 points, state variables and indefinite admittance)

For the following circuit (of homework 3) let z_L be a resistor, R_L .

- Find the indefinite admittance numbering the left node 1, the right node 2, the middle node 3 and the bottom node 4.
- Ground node 4, eliminate nodes 3 and 2 to obtain the input admittance $y(s)$.
- Assume an input current source, i_{in} , is feeding from ground into the left node and the output is the voltage, v_{out} , at node 2 (across the resistor, R_L , with respect to ground). Set up the state variable equations (with the current i_L in the inductor as the state) and from them find the transfer function, v_{out}/i_{in} .

