ENEE 610
Homework Problems for Grading, Set 1 (60 points)
Due at class M 09/15/03
Richards' Function Use and Some Theory

1.(30 points) For the following 2-port, when loaded on the right port by the impedance z_L
a) find the input impedance z_{in} seen looking into the left port in terms of z_L, r (gyration resistance), and L. .
b) express z_L as one of the four Richards' functions of the "to consider, problem 2 of set 1 of 09/03/03,"
c) give the resulting values of L and r in terms of k and $z_{in}(k)$
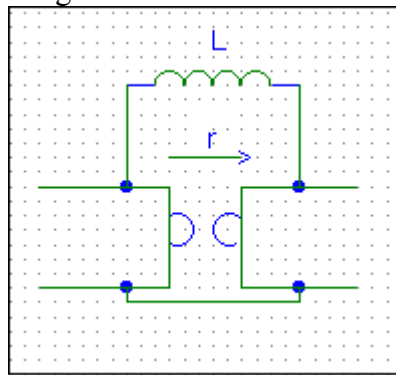
2. (30 points) For the input impedance
$$z_{in}(s) = \frac{4(s+1)(s+3)}{(s+2)(s+5)}$$
a) Find the zeros of its even part.
b) Using k with positive real parts that are zeros of this even part, give a cascade synthesis of this input impedance using only passive elements.
c) Discuss the effect of using k with negative real parts instead.

3. Extra credit (10 points max):
a) Give the reason why there are enough real positive zeros of the even part for the input impedance of 2. to be fully synthesized by a cascade of two of the 2-ports in 1 and a resistive load.
b) Prove that by extracting the 2-port of 1. from a real rational z_{in} the even part zeros of z_L are contained in the even part zeros of z_{in}.