

## ENEE 610 Fall 2019 Homework 6 Due Tu 10/15/19

## #1 (50 points: Bott-Duffin synthesis)

For the impedance  $z(s) = [3s^2 + 3s + 7] / [s^2 + s + 1]$  it is known that the real part has a minimum at  $j\omega_0$  with  $\omega_0 = \sqrt{2}$ .

- Sketch/plot  $\text{Re}\{z(j\omega)\}$  and give its minimum value and the value of  $\text{Im}\{z(j\omega_0)\}$ .
- Using these give a Bott-Duffin synthesis of the impedance  $z(s)$  using the Richards' function applied to  $z(s)$ .
- Tabulate the number of Rs, Ls and Cs used and compare with the degree of  $z(s)$  and how you know  $z(s)$  is PR.

## #2 (50 points, Richards' section synthesis).

The LPR impedance function  $z(s) = [s(s^2 + 8)] / (s^2 + 4)$  is to be synthesized using the cascade of two 2-port Richards' gyrator-C circuits

- Choose  $k=1$  for the first extracted section and  $k=2$  for the second section.
- Repeat using  $k=2$  for the first section and  $k=1$  for the second.
- Use  $k=1$  for both sections. Comment on differences between the three cases.