610 Fall 2018 – Homework 7 Due ~~Th 11/15/18~~==> Tu 11/20/18

1. (40 points, v2/v1 ladder synthesis)
    a. Synthesize the following as a lossless ladder 2-port loaded in a 1Ohm resistor and evaluate k
    a) $v2/v1 = k/[s^4 + 3s^3 + 8s^2 + 9s + 12]$
    b) $v2/v1 = ks^4/[s^4 + 3s^3 + 8s^2 + 9s + 12]$
    c) $v2/v1 = ks^2/[s^4 + 3s^3 + 8s^2 + 9s + 12]$
    d) For each of the above cases give the 2-port admittance matrix, Y(s). Check that Y(s) is lossless and compare.

2. (40 points, state variable synthesis)
    a) Synthesize the lossless impedance $z(s)= 3s(s^2+4)]/(s^2+2)$ using a state space realization of its admittance y(s). Comment about the pole of y at infinity.
    b) Using a state space realization synthesize the all-pass function
        $v2/v1=[s^2- as + b]/[s^2+as+b]$
    where a and b are any positive real parameters.

3. (20 points, all-pass Constant R)
    a) Show that the Richards' section with admittance Cs replaced by y(s) is constant-R and determine the lossless y(s) to give the all-pass function of problem 2.b) above.
    b) Discuss how Richards' sections can be used to synthesize any rational all-pass v2/v1(s).