

ENEE 610 Fall 2019 Homework 7 Due Th 10/24/19

#1 (50 points; Hurwitz test, even zeroes)

- a) For the following polynomials check via the Cauchy-type continued fraction expansion about infinity if they are strictly Hurwitz or Hurwitz. Isolate any even factors of the even and odd parts.
- a1. $P1(s) = s^4 + s^3 + 9s^2 + 4s + 18$
 - a2. $P2(s) = s^4 + s^3 + s^2 + s + 1$
 - a3. $P3(s) = s^4 + 2s^3 + 2s^2 + 4s + 1$
 - a4. $P4(s)$ the negative of a Hurwitz polynomial
 - a5. $P5(s) = s^5 + 3s^4 - 2s^3 + 2s^2 + 2s + 2$
- b) Find the even part zeroes of $y(s) = [s^2 + s + 4]/[s^2 + s + 1]$ and of $z(s) = 1/y(s)$.

#2 (50 points; Richards' section scattering matrix and semi-state equations).

- a) Give the scattering matrix for the Richards' section (the 2-port gyrator bridged by a capacitor).
- b) Given the semi-state equations for the admittance matrix $Y(s)$ as $Edx/dt = Ax + Bv$, $i = Cx$ give the semi-state-type equations for the corresponding scattering matrix $E_s dx/dt = A_s x + B_s v$, $v = C_s x + D_s v$ {by keeping the same x there is need for the added D term}.

