File: c:\temp\courses\fall2005\610\hmwrk5.doc RWN 10/19/05 -11/02/05 **ENEE 610**

Homework Problems for Grading, Set 5 (100 points) Due at class W 11/02/05 changed to M 11/07/05

Lossless and Passive Synthesis

1. (50 points)

A. For the following functions determine which are

- a) positive-real
- b) lossless (and PR)

A1.
$$y(s) = 2 \frac{s(s^2 + 6)(s^2 + 8)}{(s^2 + 3)(s^2 + 7)}$$

A2.
$$z(s) = 2 \frac{s(s^2 + 6)(s^2 + 8)}{(s^2 + 3)(s^2 + 7)}$$

A3. $z(s) = \frac{s(s^2 + 6)(s^2 + 8)}{(s^2 + 3)^2(s + 7)}$

A3.
$$z(s) = \frac{s(s^2+6)(s^2+8)}{(s^2+3)^2(s+7)}$$

A4.
$$y(s) = tanh(s)$$

B. Synthesize by the four canonical forms (1st & 2nd Foster and Cauer) the

lossless admittance
$$y(s) = \frac{5}{21} \frac{s(s^2 + 3)(s^2 + 7)}{(s^2 + 1)(s^2 + 5)}$$

2. (50 points)

For the following 2-port

a) Find the load admittance, $y_L(s)$, in terms of the input admittance y(s)and from that determine an appropriate Richards' type function to use for synthesis. Give the values of C(k) and g(k) to make the $y_L(s)$ agree with the Richards' type function.

b) Use a cascade of two of the sections to synthesize $y(s) = 2 \frac{s^2 + 2s + 4}{s^2 + s + 6.25}$

