

1. (50 points)

A. For the following functions determine which are

a) positive-real

b) lossless (and PR)

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

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

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

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

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

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

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 $y(s) = 2 \frac{s^2 + 2s + 4}{s^2 + s + 6.25}$

