Spring 2004; E4215: Analog Filter Synthesis and Design; HW6

Nagendra Krishnapura (nkrishna@vitesse.com)

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1. Design the following active versions of the Inverse Chebyshev filter (scaled to a 1 MHz passband, Fig. 1(a)) based on the prototype specified in Fig. 1(b), Table 1 and Fig. 2. Start with all resistors of $10\,\mathrm{k}\Omega$ or all g_m of $100\,\mu S$. For the cascade, show the correct pole-zero pairing and ordering. You won't be able to scale the magnitude responses without a simulator, so omit that step. Show the full schematic with component values.

   (a) (8 pts.) Cascade of opamp-RC biquad stages—zeros using feedforward.

   (b) (8 pts.) g_m-C ladder filter.

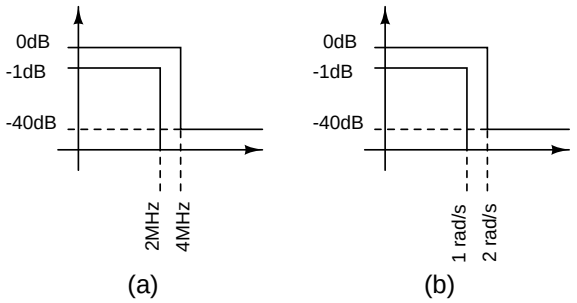

Figure 1: (a) Desired filter specs. (b) Prototype filter specs.

Table 1: Inverse chebyshev prototype zeros and poles: passband corner = 1 rad/s

Inverse Chebyshev			
zeros	poles	pole resonant frequency	pole quality factor
$\pm j3.0671$	$-0.2811 \pm j1.1013$	1.1366	2.0218
$\pm j1.8956$	$-0.9461 \pm j0.8751$	1.2887	1.4202
	-1.4202	n/a	n/a

2. (4 pts.) Determine Z_{in} in Fig. 3.

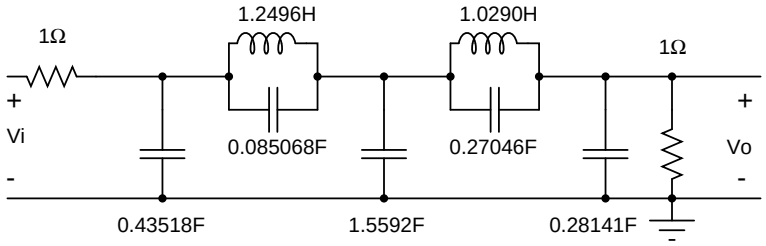

Figure 2: Inverse chebyshev doubly terminated ladder prototype with poles and zeros shown in Table 1

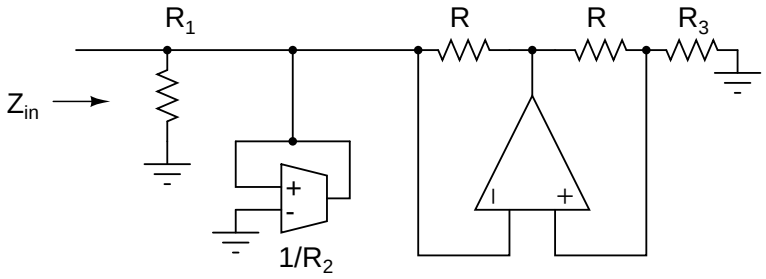

Figure 3: