

Analog Filters Using MATLAB — Corrections, version 2016-04-25

Replace in all MATLAB programs (\square) with (\llcorner) and (---) with ($-$)

Page 33,

Equation (2.18) $\dots \cos(\cdot, (N+2k-1)/2N)$

Note that $\sigma_p < 0$ for all poles and all of the coefficients in the denominator **have the same sign** in a stable analog filter.

Page 34 and 35

$[GLP, ZLP, PLP] =$

Page 42

Parameters have been changed to

$[G, Z, R_ZEROS, P] = CH_II_POLES(Wc, Ws, Amax, Amin, N)$

Page 44

left column: (2.21) be replaced with (2.27)

Page 45

Equation (2.44): the denominator for $r_{\{pk\}}$ should read $\dots [(1/N)\text{asinh}(K)]$

Page 47

Parameters have been changed to

$[G, Z, R_ZEROS, P, Wsnew] = CA_POLES(Wc, Ws, Amax, Amin, N)$

Page 56

line 11-13 in the MATLAB program should be

```
Att = MAG_2_ATT(H);
```

```
axis([0 8 0 100]), subplot('position', [0.1 0.4 0.88 0.5]);
```

```
PLOT_ATTENUATION_S(W, Att)
```

```
hold on
```

```
color = [0.7 0.7 0.7]; % Gray
```

```
V = axis;
```

```
patch([V(1) Wc Wc V(1)], [Amax Amax V(4) V(4)], color);
```

```
patch([wstep(1) wstep(1) wstep(2) wstep(2) V(2) V(2)], [0 Amin(1) Amin(1) Amin(2) Amin(2) 0], color);
```

Page 59

Eq(2.58) is only valid for allpole filters

Page 61

$[GLP, ZLP, PLP] = BW_POLES(\text{Omegac}, \text{Omegas}, Amax, Amin, NLP)$

Page 62

$GLP = 1.592185381683073e+23$

Page 67

line 7 should read LP-BS transformation

Page 69

and lowpass filters using the LP-BS transformation is

Page 69

[GLP, ZLP, R_ZEROSLP, PLP, Wsnew] = CA_POLES(Omegac, Omegas, Amax, Amin, NLP);

Page 72

add at the end of the program for Example 2.10
patch([Wc1 Wc2 Wc2 Wc1], [Amax Amax 100 100], color);

Page 75

Problem 2.24 $\omega = 2$ Mrad/s and $r_p = 10$ Mrad/s.

Problem 2.36 $\omega_{c2} = 15$ krad/s

Page 76

Problem 2.39

$\omega_{c1} = 2\pi 48.5$ rad/s $\omega_{c2} = 2\pi 51.5$ rad/s

$\omega_{s1} = 2\pi 49.5$ rad/s $\omega_{s2} = 2\pi 50.5$ rad/s

Page 81

$|C(s)|^2$ is proportional to the ratio

Page 95

line 14 replace Att with Anorm

Page 96

line 18 replace Att with Anorm

<<

Page 97

line 4 change [...] to (...) and change N to Norder

move line 6 to after line 3

line 8 replace KI with K

line 12 replace Att with Anorm

Example 3.7 $A_{min} = 40$ dB

Page 98 should read

new line 9 $Norder = 5$; % We select a 5th-order filter

line 10 [G, Z, R_ZEROS, P, Wsnew] = CA_POLES(Wc, Ws, Amax, Amin, Norder);

line 12 [L, C, Rs, RL, Wo, K] = CA_LADDER(G, Z, R_ZEROS, P, Wc, Ws, Rs, RL, Ladder);

line 16 $Anorm = MAG_2_ATT(2*H)$; % Normalize attenuation to 0 dB

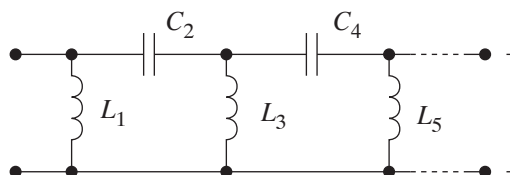
Page 117

A useful program for this step is HURWITZ.

Page 152

Eq(3.63) replace all L's with C's and vice versa

Cauer II structure should be



Page 123

Example 3.20

Determine the element values in a sixth-order allpass filter built of cascaded bridged-*T* networks which equalizes the group delay of the ladder network in Example 2.4 when $R_s = R_L = 1000 \Omega$.

The poles of the allpass filter were determined by the program in Example 2.11 ~~determined to~~

$$s_{p1,2} = -7.576348 \pm j 6.5452758 \text{ krad/s}$$

$$s_{p3,4} = -7.350304 \pm j 19.284823 \text{ krad/s}$$

$$s_{p5,6} = -6.903609 \pm j 32.393479 \text{ krad/s}$$

From Equation (3.67) we obtain the element values in the lattice structures. We get using: $1/RC_2 = -2 \operatorname{Re}\{s_p\}$ and $1/L_2C_2 = r_p^2$ and $R = 1 \text{ k}\Omega$. **The Table have new values!**

Bridged- <i>T</i>	L_1 [mH]	L_2 [mH]	C_1 [nF]	C_2 [nF]
1	65.99485	151.1616	151.1616	65.99485
2	68.0244	34.51403	34.51403	68.0244
3	72.42589	12.58637	12.58637	72.42589

Page 130

Problem 3.16 should read: Realize an *LC* ladder that meets the same specification as in Problem 3.15, but of Chebyshev I type.

Problem 3.20 should read

..... $\omega_{s1} = 11.6 \text{ Mrad/s}$, and $\omega_{c2} = 311.6 \text{ Mrad/s}$.

Page 131

3.26terminated π ladder network with

Page 137

where the function $\tan(\omega\tau)$ is periodic with period π .

Page 141

In Example 4.2. $\tau = 0.25 \text{ ns}$

and $\omega_c T = 2, 300 \cdot 10^6 \cdot 0.25 \cdot 10^{-9} = 0.15 \pi$, rad

$$|H(e^{j\omega T})|^2 = \frac{1}{1 + \left(\frac{\sin\left(\frac{\omega T}{2}\right)}{\alpha} \right)^{2N}}$$

where $\alpha = \varepsilon^{-\frac{1}{N}} \sin\left(\frac{\omega_c T}{2}\right)$

with period π . The impedance...

Page 142

In Example 4.3. $\tau = 0.25 \text{ ns}$

and $\omega_c T = 2, 300 \cdot 10^6 \cdot 0.25 \cdot 10^{-9} = 0.15 \pi$, rad

Figure 4.10 The x-axis should be from 0 to π ,

The function RICHARDS_EQ has an error do not yields a correct passband!

Page 143

Figure 4.11 The x-axis should be from 0 to π ,

Page 144

$$Z_1 = \frac{L_1 R_0}{\Omega_c} = 3.1147435 \Omega$$

$$Z_2 = \frac{\Omega_c R_0}{C_2} = 0.160527 \Omega \quad Z_3 = \frac{L_3 R_0}{\Omega_c} = 3.1147435 \Omega$$

Page 146

Example 4.5 change to a **Chebyshev I** filter

Page 146

line -7: $X = \frac{K}{1 - \left(\frac{K}{Y_0}\right)^2}$

Page 152

Problem 4.8

the relative **3-dB** bandwidth

Page 152

Equation(5.74) simplifies for ideal amplifiers to $Z_{in} = Z_1 Z_3 Z_5 / Z_2 Z_4$

Page 200

$$Q_{nominal} = \frac{-r_p}{2\sigma_p} = \frac{-\sqrt{(5\pi)^2 + (50\pi)^2}}{2 \cdot (-5\pi)} = 5.0249378$$

Page 201

$$D(s) + \frac{E(s)}{A} =$$

Page 201

Fig. 7.10 **Tow**-Thomas

Page 201

6.5.3.7 **NF2** Sections

Page 205

where the amplifier has a **positive gain of** $K = (1 + R_8/R_7) > 1$. **We shall** later discu

Page 206

delete the line

a **positive gain of** $K = (1 + R_8/R_7) > 1$. **We shall**

Page 213

Spreads in passive elements are $\propto Q^2$.

Page 224

Table, second line

$$HP \quad 0 \quad V_{in} \quad V_{in} \quad R_2 = R_1$$

Page 237

7.3.2 Flicker Noise

Page 245

Fig. 7.14 Coupled form of type FLF

Page 260

Line 3, second column: example $k = 10^5$ [1/s].

Page 273

output wave is B_2 , which corresponds to the output voltage V_{B2} .

Page 279

the **marked** minus signs across the nodes..

Page 279

Hence, the sign of V_7 is changed

Page 280

Figure 10.9 Interchange the inputs to the rightmost amplifier

Page 281

determined by **comparing** the circuits

Page 282

from the node that is

Page 289

10.1 .. leapfrog **filter**

Pages 309 and 310

BESSEL_ORDER 59

BESSEL_POLES

BESSEL_LADDER

BP_2_LP_SPEC

BS_2_LP_SPEC

BW_LADDER 94, 95

BW_ORDER 34

BW_POLES 34

BW_SINGLY_LADDER

CA_POLES 50

CA_B_POLES 52

CA_C_POLES 53

CA_LADDER 97

CA_MIN_Q_POLES

CA_ORDER 48

CH_I_C_POLES 53

CH_I_LADDER 96

CH_I_POLES 39

CH_I_SINGLY_LADDER

CH_II_B_POLES 52

CH_II_LADDER 96

CH_II_POLES 46

CH_ORDER 39, 44

CIRCULATOR_THREE_BP 271
CIRCULATOR_THREE_LP 271
COMPLETE_ELLIPTIC_INTEGRAL
EQ_TG_LP_S 73
HURWITZ 113
HURWITZ_POLY 32
HURWITZ_ROOTS 32
LADDER_2_H 96
LP_2_HP_LADDER
LP_LADDER
PART_FRACT_EXPANSION 120
PLOT_A_TG_S 35
PLOT_ATTENUATION_S
PLOT_h_s_S 36
PLOT_HP_SPEC_S
PLOT_IMPULSE_RESPONSE_S
PLOT_LP_SPEC_S
PLOT_MAG_PHASE_S
PLOT_PHASE_S
PLOT_PZ_S 35
PLOT_STEP_RESPONSE_S
PLOT_TG_S
POLE_PLACER_BP_EQ_S 56
POLE_PLACER_BP_MF_S 56, 71
POLE_PLACER_HP_EQ_S 56
POLE_PLACER_HP_MF_S 56
POLE_PLACER_LP_EQ_S 56
POLE_PLACER_LP_MF_S 56
POLY_AT_X
POLY_PRIM
POLYADD
POLYMULT
POLYSUB
PRAXIS
PRB 249
PZ_2_FREQ_S 35
PZ_2_G_SYM_BP_S 65
PZ_2_G_SYM_BS_S 69
PZ_2_HP_S 61
PZ_2_IMPULSE_RESPONSE_S 36
PZ_2_MAG_S
PZ_2_PHASE_S
PZ_2_STEP_RESPONSE_S 36
PZ_2_TG_S 35
RICHARDS_EQ 141
RICHARDS_MF 141
RICHARDS_REACTANCE 140
ROOTS_2_POLY
T_LADDER_2_PI
UNIQUE_ROOTS
xtick
ytick
ZIN_LADDER