

Digital Signal Processing: A Computer-Based Approach

3rd Edition

by

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Errata List

Chapter 1

1. Page 4, Eq. (1.1): Replace the lower limit of the integral with “ $-\infty$ ”.

Chapter 2

1. Page 45, line 2 below Eq. (2.9): Insert “for a length- N sequence,” after “definition that”. Delete “the \mathcal{L}_2 -norm”, and replace “ $\|x\|_2$ ” with “ $\|x\|_2 / \sqrt{N}$ ”. Delete “the \mathcal{L}_1 -norm”.
2. Page 45, line 3 below Eq. (2.9): Replace “ $\|x\|_1$ ” with “ $\|x\|_1 / N$ ”.
3. Page 49, Example 2.3, line 4: Replace “Example 2.1” with “Example 2.2”.
4. Page 61, Example 2.9, first line: Replace “0.5” with “0.05”.
5. Page 67, Figure 2.23: Replace “Discrete-time sequence” with “Discrete-time system”.
6. Page 73, last line: Replace “Figure 2.28(a)” with “Figure 2.6(a)”.
7. Page 78, line 6 from top: Replace “ $\{1, 0.5, 1\}$ ” with “ $\{0.5, 1, 0.5\}$ ”.
8. Page 109, Problem 2.20: Replace “Eq. (2.22)” with “Eq. (2.29)”.
9. Page 109, Problem 2.29: Replace “ $\{1 \ -1 \ -1 \ 1 \ 1 \ -1 \ -1 \ 1\}$ ” with “ $\{1 \ -1 \ -1 \ 1\}$ ”, “ $\{0 \ -\sqrt{3} \ 0 \ \sqrt{3} \ 0 \ -\sqrt{3} \ 0 \ \sqrt{3}\}$ ” with “ $\{0 \ -\sqrt{3} \ 0 \ \sqrt{3}\}$ ”, and “ $\{2 \ 0 \ -2 \ 0 \ 2 \ 0 \ -2 \ 0\}$ ” with “ $\{2 \ 0 \ -2 \ 0\}$ ”, respectively.
10. Page 110, Problem 2.42: Replace “2.63” with “2.66”.
11. Page 114, Problem 2.79: Replace “Eq. (2.80)” with “Eq. (2.90)”.

12. Page 115, Problem M2.1, Parts (a) and (b): Replace “Program 2_1” with “Program 2_2.”

Chapter 3

1. Page 120, line 6 from bottom: Replace “he” with “the”.
2. Page 126, Eq. (3.26): Replace “ $(\cos\omega n + \sin\omega n)$ ” with “ $(\cos\omega n - \sin\omega n)$ ”, replace “ $(x_{\text{re}}[n]\cos\omega n - x_{\text{im}}[n]\sin\omega n) + j$ ” with “ $(x_{\text{re}}[n]\cos\omega n + x_{\text{im}}[n]\sin\omega n)$ ”, and replace “ $\sum_{n=-\infty}^{\infty} (x_{\text{im}}[n]\cos\omega n + x_{\text{re}}[n]\sin\omega n)$ ” with “ $+ j \sum_{n=-\infty}^{\infty} (x_{\text{im}}[n]\cos\omega n - x_{\text{re}}[n]\sin\omega n)$ ”.
3. Page 126, Eq. (3.29a): Replace “ $(x_{\text{re}}[n]\cos\omega n - x_{\text{im}}[n]\sin\omega n)$ ” with “ $(x_{\text{re}}[n]\cos\omega n + x_{\text{im}}[n]\sin\omega n)$ ”.
4. Page 126, Eq. (3.29b): Replace “ $(x_{\text{im}}[n]\cos\omega n + x_{\text{re}}[n]\sin\omega n)$ ” with “ $(x_{\text{im}}[n]\cos\omega n - x_{\text{re}}[n]\sin\omega n)$ ”.
5. Page 128, line 4 above Eq. (3.36): Replace “ $X * (e^{j\omega})$ ” with “ $X * (e^{-j\omega})$ ”.
6. Page 132, Line below Eq. (3.44): Replace “case, $X_K(e^{j\omega})$ ” with “case, $X(e^{j\omega})$ ”.
7. Page 134, Figure 3.6 caption: Replace “(3.51)” with “(3.50)”.
8. Page 137, line 2 from bottom: Replace “Example 3.5” with “Example 3.6”.
9. Page 143, line 10 from top: Replace “ $X(ej\omega)$ ” with “ $X(e^{j\omega})$ ”.
10. Page 145, Eq. (3.75): Replace “ $|X(e^{j\omega})|$ ” with “ $\ln|X(e^{j\omega})|$ ”.
11. Page 151, line 14 from bottom: Replace “with” with “from”.
12. Page 161, Problem 3.5: Replace “ $\sin(2\pi t)$ ” with “ $\sin(t)$ ”.
13. Page 161, Problem 3.6(d): Replace “ $X_a\left(\frac{\Omega}{a}\right)$ ” with “ $X_a\left(j\frac{\Omega}{a}\right)$ ”.
14. Page 162, Problem 3.16: Replace “1..” with “1.”.

15. Page 163, Problem 3.21(d): Replace “ $\frac{j\alpha e^{j\omega}}{(1-\alpha e^{j\omega})^2}$ ” with “ $\frac{-\alpha e^{-j\omega}}{(1-\alpha e^{-j\omega})^2}$ ”.
16. Page 164, Problem 3.37: Replace “ $-3 \leq n \leq 7$ ” with “ $-3 \leq n \leq 6$ ”.
17. Page 166, Problem 3.46: Delete “of each” and replace “systems” with “system”.
18. Page 166, Problem 3.48: Replace “systems” with “system”.
19. Page 166, Problem 3.49(a): Replace “with a frequency” with “and a frequency”.
20. Page 167, Problem 3.56: Replace “ $\delta[n] + a\delta[n-1] + b\delta[n-2]$ ” with “ $a\delta[n] + b\delta[n-1] + \delta[n-2]$ ”.
21. Page 167, Problem 3.61(d): Replace “ $H_b(e^{j\omega})$ ” with “ $H_d(e^{j\omega})$ ”.
22. Page 168, Problem 3.74(a): Replace “ $0 \leq n \leq 3$ ” with “ $0 \leq n \leq 4$ ”.

Chapter 4

1. Page 180, Figure 4.8 caption: Replace “kHz” with “Hz”.
2. Page 180, Figure 4.9 caption: Replace “kHz” with “Hz”.
3. Page 186, Lines 5-6 from bottom: Replace “the extended bandwidth $\Omega_H - \Omega_o$ is an integer multiple of Ω_H ” with “ Ω_H is an integer multiple of the extended bandwidth $\Omega_H - \Omega_o$ ”.
4. Page 219, Line 2 below Eq. (4.77): Replace “ $2R_L$ ” with “ R_L ”.
5. Page 230, Problem 4.29: Replace “1” in the numerator of $H_{HP}(s)$ with “ s^3 ”.

Chapter 5

1. Page 244, Line 2 from bottom: Replace “ $0, 1, \dots, N,$ ” with “ $0, 1, \dots, N-1,$ ”.
2. Page 246, Line 2 below Eq. (5.52): Replace “circshift” with “circshift1”.
3. Page 258, Table 5.1: Replace “ jX_{im} ” with “ $jX_{im}[n]$ ”.
4. Page 261, Figure 5.11: The rightmost block should be labeled “N-point IDFT”.

5. Page 263, line 2 from bottom: Replace “5.30” with “5.31”.
6. Page 264, line 6 from top: Replace “ $W_N^{-kn_o} G[k]$ ” with “ $W_N^{kn_o} G[k]$ ”.
7. Page 264, line 7 from top: Replace “ $W_N^{-k_o} g[n]$ ” with “ $W_N^{-k_o n} g[n]$ ”.
8. Page 266, Eq. (5.122): Replace “ $\{H[k]\} = \{6 \ 1-j \ 0 \ 1+j\}$ ” with “ $\{H[k]\} = \{6 \ 1-j \ 0 \ -1+j\}$ ”.
9. Page 269, Figure 5.14(b): Replace “ $\times 10^{16}$ ” with “ $\times 10^{-16}$ ”.
10. Page 274, Line 3 from bottom: Replace “ $X[(N-2)/2]$ ” with “ $X[N/2]$ ”.
11. Page 288, Figure 5.23: Interchange “DFT” and “Haar” inside the figure.
12. Page 290, Problem 5.12: Replace “ $x_1[n] = \left(x[n] + x\left[\frac{N}{2} + n\right]\right)W_N^n$ ” with “ $x_1[n] = \left(x[n] - x\left[\frac{N}{2} + n\right]\right)W_N^n$ ”.
13. Page 291, Problem 5.15: Replace “ $h[n] = \begin{cases} 0, & 0 \leq n \leq N-1, \\ x[n], & N \leq n \leq 2N-1. \end{cases}$ ” with “ $h[n] = \begin{cases} 0, & 0 \leq n \leq N-1, \\ x[n-N], & N \leq n \leq 2N-1. \end{cases}$ ”.
14. Page 291, Problem 5.16: Replace “and $H[k]$ ” with “ $H[k]$, and $X[k]$ ”.
15. Page 293, Problem 5.34, Part (b): Replace “ $X[6]$ ” with “ $X[5]$ ”.
16. Page 293, Problem 5.35: Replace “first 6” with “first 7”, “15” with “ $2+j$ ”, and “ $2+j$ ” with “15”.
17. Page 293, Problem 5.38: Replace “ $X[7]$ ” with “ $X[8]$ ”.
18. Page 293, Problem 5.41: Replace “ $X[k_4] = -3.4 + j5.9$ ” with “ $X[k_4] = -3.4 - j5.9$ ”.
19. Page 294, Problem 5.43: Replace “- 2 4” with “- 2, 4”.
20. Page 294, Problem 5.44: Replace “,” with “,” and “ $e^{j2\pi/3}$ ” with “ $e^{j2\pi n/3}$ ”.
21. Page 294, Problem 5.49: Replace “even” with “real” and replace “odd” with “imaginary”.

22. Page 295, Problem 5.51: Replace “ $M = N = 3$ ” with “ $M = N = 4$ ”.
23. Page 295, Problem 5.54, Part (b): Replace “ $\pi/5$ ” with “ $\pi/4$ ”.
24. Page 295, Problem 5.58, Part (b): Replace “15” with “21”.
25. Page 297, Problem 5.62: Replace “[17 -17 -17 17]” in the third row of the matrix \mathbf{H}_N with “[13 -13 -13 13]” and the fourth row “[7 -7 7 -7]” with “[7 -17 17 -7]”, and replace “[1 -1 -1 17]” in the third row of matrix \mathbf{G}_N with “[1 -1 -1 1]”.

Chapter 6

1. Page 304, Line 4 from top: Replace “ $\sum_{n=0}^{\infty} \alpha^{-n} z^n$ ” with “ $\sum_{m=0}^{\infty} \alpha^{-m} z^m$ ”.
2. Page 304, Line above Eq. (6.12): Replace “ z^{-M} ” with “ $\alpha^M z^{-M}$ ”.
3. Page 304, Eq. (6.12): Replace “ $z^{-M} \sum_{n=0}^{N-M-1} (\alpha z^{-1})^n$ ” with “ $\alpha^M z^{-M} \sum_{n=0}^{N-M-1} (\alpha z^{-1})^n$ ”,
replace “ $z^{-M} \left(\frac{1 - \alpha^{N-M} z^{-(N-M)}}{1 - \alpha z^{-1}} \right)$ ” with “ $\alpha^M z^{-M} \left(\frac{1 - \alpha^{N-M} z^{-(N-M)}}{1 - \alpha z^{-1}} \right)$ ” and replace
“ $z^{-M} - \alpha^{N-M} z^{-N}$ ” with “ $\alpha^M z^{-M} - \alpha^N z^{-N}$ ”.
4. Page 310, Line 11 from bottom: Replace “factor” with “factorize”.
5. Page 322, Line 2 from bottom: Replace “ $2(0.2)^n \mu[n]$ ” with “ $5(0.2)^n \mu[n]$ ”.
6. Page 323, Line 6 from top: Replace “ $2 \left(\frac{1}{1 - 0.2z^{-1}} \right)$ ” with “ $5 \left(\frac{1}{1 - 0.2z^{-1}} \right)$ ” and
replace “ $6 + 0.2z^{-1}$ ” with “ $9 + 1.7z^{-1}$ ”.
7. Page 323, Eq. (6.56): Replace “ $6 + 0.2z^{-1}$ ” with “ $9 + 1.7z^{-1}$ ”.
8. Page 344, Eq. (6.108): Replace “ $0.3z + -0.18$ ” with “ $0.3z - 0.18$ ”.
9. Page 344, Problem 6.12: Replace “length-12” with “length-10”.

10. Page 345, Problem 6.23: Replace it with the following: “Determine the z -transform of each of the following left-sided sequences:

(a) $x[n] = \alpha^n \mu[-n-1]$, (b) $y[n] = (n+1)\alpha^n \mu[-n-1]$.”

3. Page 349, Problem 6.44: Replace “ $\frac{1 - \alpha z^{-2}}{1 - 2\alpha \cos(\omega_c)z^{-1} + \alpha^2 z^{-2}}$ ” with

“ $\frac{1 - z^{-2}}{1 - (1 + \alpha) \cos(\omega_c)z^{-1} + \alpha z^{-2}}$,” and replace “ $1/(1 - \alpha)$ ” with “ $2/(1 - \alpha)$ ”.

4. Page 350, Problem 6.52: Replace it with the following: “Let $H(z)$ be the transfer function of a causal, stable LTI discrete-time system. Consider the transfer function $G(z) = H(z)|_{z=F(z)}$. What are the conditions that need to be satisfied by the transformation $F(z)$ so that remains stable?”

5. Page 350, Problem 6.53: Replace it with the following: “Determine the z -transform $F(z)$ of the Fibonacci sequence $\{f[n]\}$ of Problem 2.70. Evaluate the inverse z -transform of $F(z)$.”

6. Page 351, Problem 6.58: Replace “ $\tau_g(\omega) = \frac{H(z) + H(z^{-1})}{2} \Big|_{z=e^{j\omega}}$.” with

“ $\tau_g(\omega) = \frac{T(z) + T(z^{-1})}{2} \Big|_{z=e^{j\omega}}$,” and add at the bottom of the equation “where

$$T(z) = z \frac{dH(z)/dz}{H(z)}.”$$

Chapter 7

1. Page 367, line 3 from top: Replace the second “ $H_1(z)$ ” with “ $H_2(z)$ ”.

2. Page 369, line below Eq. (7.41): Replace “Since $\check{H}(-\omega) = \check{H}(\omega)$,” with “From the above”.

3. Page 369, line below Eq. (7.43): Insert “and making use of the relation $\check{H}(-\omega) = \check{H}(\omega)$ ” after “(7.43)”.

4. Page 418, Problem 7.49: Replace it with “If $H(z)$ is a bandpass filter with passband edges at ω_{p1} and ω_{p2} , and stopband edges at ω_{s1} and ω_{s2} , with $\omega_{s1} < \omega_{p1} < \omega_{p2} < \omega_{s2}$, what type of filter is $H(-z)$? Determine the locations of the bandedges of $H(-z)$ in terms of the bandedges of $H(z)$.”

5. Page 418, Problem 7.53: Replace “ $-j0.3$ ” with “ $-j$ ”.
6. Page 421, Problem 7.79: Replace “ $0.5 - 0.4z^{-1} + 0.8z^{-2} + 0.8z^{-3} - 0.4z^{-4} + 0.5z^{-5}$,” with “ $-0.1 + 0.5z^{-1} + 0.05z^{-2} + 0.05z^{-3} + 0.5z^{-4} - 0.1z^{-5}$ ”.
7. Page 423, Problem 7.89, Part (b): Replace “ $0.2(1 - z^{-2})$ ” with “ $0.1(1 - z^{-2})$ ”.
8. Page 423, Problem 7.90, Part (b): Replace “ $4.5 + 6z^{-1} + 6z^{-2} + 4.5z^{-3}$ ” with “ $3 + 7.5z^{-1} + 7.5z^{-2} + 3z^{-3}$ ”.
9. Page 425, Problem M7.5: Replace “ $1 - 0.2742z^{-2} + z^{-3}$ ” with “ $1 - 0.2742z^{-1} + z^{-2}$ ”.
10. Page 425, Problem M7.7: Replace “(7.64)” with “(7.71)”.
11. Page 425, Problem M7.8: Replace “(7.67)” with “(7.74)”.

Chapter 8

1. Page 483, Problem 8.35: Replace “realizes” with “is” and replace “transfer” with “filter”.
2. Page 484, Problem 8.37: Replace “multipliers” with “delays”.
3. Page 484, Problem 8.39: Replace “3H” with “3B”, and “multipliers” with “delays”.
4. Page 485, Problem 8.48, Part (c): Replace “0.3885” with “0.5414”, and “0.2543” with “0.0757”.
5. Page 485, Problem 8.48, Part (d): Replace “0.3646” with “0.4547”, and “0.147” with “-0.2859”.
6. Page 488, Problem M8.7: Replace
“ $G(z) = \frac{0.3288(1 + 0.8917z^{-1} + 1.6721z^{-2} + 1.6721z^{-3} + 0.8917z^{-4} + z^{-5})}{1 - 0.2086z^{-1} + 0.9966z^{-2} + 0.1916z^{-3} + 0.2604z^{-4} + 0.1035z^{-5}}$,” with
“ $G(z) = \frac{0.2801(1 - 0.6006z^{-1} + 1.0338z^{-2} + 1.0338z^{-3} - 0.6006z^{-4} + z^{-5})}{1 - 1.9607z^{-1} + 2.9395z^{-2} - 2.14486z^{-3} + 1.165z^{-4} - 0.1962z^{-5}}$ ”.

7. Page 488, Problem M8.8: Replace

$$“G(z) = \frac{0.2879(1 + 0.1318z^{-1} + 1.1861z^{-2} - 1.1861z^{-3} - 0.1318z^{-4} - z^{-5})}{1 + 1.5734z^{-1} + 2.704z^{-2} + 1.9461z^{-2} + 1.3007z^{-3} + 0.3025z^{-5}}” \text{ with}$$

$$“G(z) = \frac{0.2876(1 + 0.1318z^{-1} + 1.1861z^{-2} - 1.1861z^{-3} - 0.1318z^{-4} - z^{-5})}{1 + 1.57274z^{-1} + 2.712z^{-2} + 1.9431z^{-2} + 1.2979z^{-3} + 0.3018z^{-5}}.”$$

Chapter 9

1. Page 497, Eq. (9.23): Delete “ T ” in the numerator and denominator on the right hand side of the equation.
2. Page 498, Eqs. (9.30a): Delete “ T ” in the numerator and denominator on the right hand side of the equation.
3. Page 498, Eq. (9.30b): Delete “ T ” on the right hand side of the equation.
4. Page 506, Eq. (9.40): Replace “ $F^{-1}(\hat{z})$ ” with “ $1/F(\hat{z})$ ”.
5. Page 517, Problem 9.8: Replace it with “Using Eq. (9.58), develop the expression for the causal digital transfer function $G(z)$ obtained from the causal analog transfer function $H(s) = \frac{A}{s+\alpha}$ via the impulse invariance method.
6. Page 520, Eq. (9.60): Replace it with “ $G_{LP}(z) = \frac{0.1944(1 + 0.9802z^{-1} + z^{-2})}{1 - 0.7016z^{-1} + 0.281z^{-2}}$.”.

Chapter 10

1. Page 533, Eq. (10.30): Replace “ $\cos\left(\frac{2\pi n}{2M+1}\right)$ ” with “ $\cos\left(\frac{\pi n}{M}\right)$ ”.
2. Page 533, Eq. (10.31): Replace “ $\cos\left(\frac{2\pi n}{2M+1}\right)$ ” with “ $\cos\left(\frac{\pi n}{M}\right)$ ”.
3. Page 533, Eq. (10.30): Replace “ $\cos\left(\frac{2\pi n}{2M+1}\right)$ ” with “ $\cos\left(\frac{\pi n}{M}\right)$ ”, and replace “ $\cos\left(\frac{4\pi n}{2M+1}\right)$ ” with “ $\cos\left(\frac{2\pi n}{M}\right)$ ”.
4. Page 535, Table 10.2: Replace “Barlett” with “Bartlett”.
5. Page 550, Line 2 below Eq. (10.84): Replace “ ω ” with “ π ”.
6. Page 550, Line 2 above Eq. (10.86): Replace “and” with “with”.

7. Page 550, Eq. (10.87a): Replace it with “ $\delta_p^{(F)} = \sqrt{1 + \frac{\delta_p}{1 + \delta_s}} - 1$ ”.
8. Page 562, Example 10.22: In line 15 of the M-file minphase.m in the CD, replace “h” with “g”.
9. Page 569, Figure 10.35: Replace “ $\tilde{H}(\omega)$ ” with “ $\tilde{H}_{\text{IFIR}}(\omega)$ ”.
10. Page 569, Line 4 from bottom: Replace “ $H(z)$ ” with “ $H_{\text{IFIR}}(z)$ ”.

Chapter 11

1. Page 596, Eq. (11.9): Replace the second row of \mathbf{T} with “-1 1 δ 0 0 0”.
2. Page 622, Line 2 below Eq. (11.63): Replace “ $x[[n_1 + N_1 n_2]]$ ” with “ $x[n_1 + N_1 n_2]$ ”.
3. Page 622, Eq. (11.64): Replace “ $X[k_1 + N_1 k_2]$ ” with “ $X[N_2 k_1 + k_2]$ ”.

Chapter 12

1. Page 734, Figure P12.8: Replace “0.7” with “0.12”.

Chapter 13

1. Page 767, Line 12 from bottom: Replace “Type II” with “Type I”.
2. Page 768, Figure 13.33: Replace “ $R_0(z)$ ”, “ $R_1(z)$ ”, “ $R_k(z)$ ”, and “ $R_{L-1}(z)$ ” with “ $E_0(z)$ ”, “ $E_1(z)$ ”, “ $E_k(z)$ ”, and “ $E_{L-1}(z)$ ”, respectively.
3. Page 768, Figure 13.34: Replace “ $R_k(z)$ ” with “ $E_k(z)$ ”.
4. Page 768, Figures 13.35(a) and (b): Replace “ $R_0(z)$ ”, “ $R_1(z)$ ”, “ $R_k(z)$ ”, and “ $R_{L-1}(z)$ ” with “ $E_0(z)$ ”, “ $E_1(z)$ ”, “ $E_k(z)$ ”, and “ $E_{L-1}(z)$ ”, respectively.
Replace “ z^{-k} ” with “ $z^{-\mu}$ ” and interchange the up-samplers and down-samplers.
5. Page 769, Figure 13.37 (a): Replace “ $R_0(z)$ ” and “ $R_1(z)$ ” with “ $E_0(z)$ ” and “ $E_1(z)$ ”, respectively.
6. Page 793, Problem 13.25: Replace “ $y[n]$ ” with “ $u[n]$ ”.

Chapter 14

1. Page 833:

```

% Program 14_1
% Frequency Responses of Tree-Structured QMF Filters
%
clf;
% Type in prototype lowpass filter coefficients
% B1 = input ('Filter coefficients = ');
B1 = [0.002329266,-0.005182978,-0.002273145,0.01354012,-0.0006504669,...
      -0.02755195,0.01004621,0.05088162,-0.03464143,...
      -0.09987885,0.12464520,0.4686479]; % Test coefficients
B1 = [B1 fliplr(B1)];
% Generate the complementary highpass filter
L = length(B1);
for k = 1:L
    B2(k) = ((-1)^k)*B1(k);
end
% Determine the coefficients of the four filters
B10 = zeros(1, 2*length(B1));
B10([1: 2: length(B10)]) = B1;
B11 = zeros(1, 2*length(B2));
B11([1: 2: length(B11)]) = B2;
C0 = conv(B1, B10);C1 = conv(B1, B11);
C2 = conv(B2, B10);C3 = conv(B2, B11);
% Determine the frequency responses
[H00z, w] = freqz(C0, 1, 256);% corrected
h00 = abs(H00z);
M00 = 20*log10(h00);
[H01z, w] = freqz(C1, 1, 256);
h01 = abs(H01z);
M01 = 20*log10(h01);
[H10z, w] = freqz(C2, 1, 256);
h10 = abs(H10z);
M10 = 20*log10(h10);
[H11z, w] = freqz(C3, 1, 256);
h11 = abs(H11z);
M11 = 20*log10(h11);
plot(w/pi, M00,'-',w/pi, M01,'--',w/pi, M10,'--',w/pi,M11,'-');%corrected
xlabel('\omega/\pi'); ylabel('Gain, dB');grid
axis([0,1,-150,10])

```

2. Page 846, Figure P14.2: Replace “ $|F_1(e^{j\omega})|$ ” with “ $|G_1(e^{j\omega})|$ ”.
3. Page 847, Problem 14.11: Insert “elliptic” after “lowpass”.
4. Page 847, Problem 14.17: Replace “ $3z^{-2}$ ” with “ $4z^{-2}$ ”, “2” with “ z^{-1} ”, “ $1.5z^{-1}$ ” with “ $0.5z^{-1}$ ”, and “ $4z^{-1}$ ” with “ z^{-2} ”.

5. Page 848, Problem 14.26: Replace it with the following: “The lowpass analysis filter of a two-channel QMF bank is given by $H(z) = a + bz^{-1} + cz^{-2} + dz^{-3} + ez^{-4} + fz^{-5}$. Determine the highpass analysis filter $H_1(z)$, and the two synthesis filters, $G_0(z)$ and $G_1(z)$, so that the QMF bank is an orthogonal filter bank.
6. Page 848, Problem 14.31, Part (c): Replace “ $P_m(z)$ ” with “ $P_m(z^{-1})$ ”.

Chapter 15

1. Page 887, Eq. (15.72): Replace “ ω ” with “ ω_c ”.
2. Page 889, Line below Eq. (15.76): Replace “is” with “determines” and insert “ ω_o ” after “frequency”.
3. Page 892, Eq. (15.82): Replace “ $y[n - R_1]$ ” with “ $y[n - R - 1]$ ”.
4. Page 909, Line 5 from top: Replace “ $2x[n - 2]$ ” with “ $4x[n - 2]$ ”.
5. Page 909, Line 8 from top: Replace “ $d = 2$ ” with “ $d = 4$ ”.
6. Page 911, line above Eq. (15.119): Replace “Figure 11.56(b)” with “Figure 15.51(b)” and “Figure 11.57” with “Figure 15.52”.
7. Page 915, Figure 15.59: The down-sampling factor of the down-sampler should be M .
8. Page 922, Program 15_13.m

```

% Program 15_13
% Sigma-Delta D/A Converter Operation
%
%clf;
% Generate the input sinusoidal sequence
N = input('Type in length of the input sequence = ');
A = input('Type in amplitude of the input = ');
w0 = 2*pi*0.02;
n = 1:N;
m = n-1;
x = A*cos(w0*m);
axis([0 N -1 1]);
stem(m,x);
xlabel('Time index'); ylabel('Amplitude');
title('Input digital signal');
pause
% Generation of quantized output

```

```

x = (x)/(A);
y = zeros(1,N+1);
a = zeros(1,N+1);
e = 0;
for k = 2:N+1
    a(k) = x(k-1) - e;
    if a(k) >= 0,
        y(k) = 1;
    else
        y(k) = -1;
    end
    e = y(k) - a(k);
end
yn = y(2:N+1);
axis([0 N -1.2 1.2]);
stem(m, yn); % Plot the quantized output
xlabel('Time'); ylabel('Amplitude');
title ('Digital output of sigma-delta quantizer');
pause
Y = fft(yn);
H = [1 1 0.5 zeros(1,N-5) 0.5 1];% Lowpass filter
YF = Y.*H; % Filtering in the DFT domain
out = ifft(YF);
plot(m,out);
xlabel('Time'); ylabel('Amplitude');
title ('Lowpass filtered analog output');

```

Appendix A

1. Page 934, line 4 above Eq. (A.31a): Delete “[?]”.
2. Page 935, Line above Eq. (A.33): Replace “Eq. (A.16)” with “Eq. (A.20b)”.
3. Page 935, Line above Eq. (A.34): Replace “Eq. (A.17)” with “Eq. (A.20c)”.

Tuesday, September 30, 2008