

Filter Summary Report: CG,TIA,simple,Z2,Z4

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Contents

1 Examined $H(z)$ for CG TIA simple Z2 Z4: $\frac{Z_2Z_4g_m+Z_4}{2Z_2g_m+2}$

$$H(z) = \frac{Z_2Z_4g_m + Z_4}{2Z_2g_m + 2}$$

2 HP

3 BP

3.1 BP-1 $Z(s) = \left(\infty, \ R_2, \ \infty, \ \frac{L_4R_4s}{C_4L_4R_4s^2+L_4s+R_4}, \ \infty, \ \infty \right)$

$$H(s) = \frac{L_4R_4s}{2C_4L_4R_4s^2 + 2L_4s + 2R_4}$$

Parameters:

Q: $C_4R_4\sqrt{\frac{1}{C_4L_4}}$
wo: $\sqrt{\frac{1}{C_4L_4}}$
bandwidth: $\frac{1}{C_4R_4}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_4}{2}$
Qz: 0
Wz: None

3.2 BP-2 $Z(s) = \left(\infty, \ \frac{1}{C_2s}, \ \infty, \ \frac{L_4R_4s}{C_4L_4R_4s^2+L_4s+R_4}, \ \infty, \ \infty \right)$

$$H(s) = \frac{L_4R_4s}{2C_4L_4R_4s^2 + 2L_4s + 2R_4}$$

Parameters:

Q: $C_4R_4\sqrt{\frac{1}{C_4L_4}}$
wo: $\sqrt{\frac{1}{C_4L_4}}$
bandwidth: $\frac{1}{C_4R_4}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_4}{2}$
Qz: 0
Wz: None

3.3 BP-3 $Z(s) = \left(\infty, \ \frac{R_2}{C_2R_2s+1}, \ \infty, \ \frac{L_4R_4s}{C_4L_4R_4s^2+L_4s+R_4}, \ \infty, \ \infty \right)$

$$H(s) = \frac{L_4R_4s}{2C_4L_4R_4s^2 + 2L_4s + 2R_4}$$

Parameters:

Q: $C_4R_4\sqrt{\frac{1}{C_4L_4}}$
wo: $\sqrt{\frac{1}{C_4L_4}}$
bandwidth: $\frac{1}{C_4R_4}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_4}{2}$
Qz: 0
Wz: None

3.4 BP-4 $Z(s) = \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2 + L_4 s + R_4}, \infty, \infty \right)$

Parameters:

Q: $C_4 R_4 \sqrt{\frac{1}{C_4 L_4}}$
 wo: $\sqrt{\frac{1}{C_4 L_4}}$
 bandwidth: $\frac{1}{C_4 R_4}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_4}{2}$
 Qz: 0
 Wz: None

$$H(s) = \frac{L_4 R_4 s}{2C_4 L_4 R_4 s^2 + 2L_4 s + 2R_4}$$

3.5 BP-5 $Z(s) = \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2 + L_4 s + R_4}, \infty, \infty \right)$

Parameters:

Q: $C_4 R_4 \sqrt{\frac{1}{C_4 L_4}}$
 wo: $\sqrt{\frac{1}{C_4 L_4}}$
 bandwidth: $\frac{1}{C_4 R_4}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_4}{2}$
 Qz: 0
 Wz: None

$$H(s) = \frac{L_4 R_4 s}{2C_4 L_4 R_4 s^2 + 2L_4 s + 2R_4}$$

3.6 BP-6 $Z(s) = \left(\infty, L_2 s + R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2 + L_4 s + R_4}, \infty, \infty \right)$

Parameters:

Q: $C_4 R_4 \sqrt{\frac{1}{C_4 L_4}}$
 wo: $\sqrt{\frac{1}{C_4 L_4}}$
 bandwidth: $\frac{1}{C_4 R_4}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_4}{2}$
 Qz: 0
 Wz: None

$$H(s) = \frac{L_4 R_4 s}{2C_4 L_4 R_4 s^2 + 2L_4 s + 2R_4}$$

3.7 BP-7 $Z(s) = \left(\infty, \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1}, \infty, \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2 + L_4 s + R_4}, \infty, \infty \right)$

Parameters:

Q: $C_4 R_4 \sqrt{\frac{1}{C_4 L_4}}$
 wo: $\sqrt{\frac{1}{C_4 L_4}}$
 bandwidth: $\frac{1}{C_4 R_4}$

$$H(s) = \frac{L_4 R_4 s}{2C_4 L_4 R_4 s^2 + 2L_4 s + 2R_4}$$

K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_4}{2}$
 Qz: 0
 Wz: None

$$\mathbf{3.8 \quad BP-8} \quad Z(s) = \left(\infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, \frac{L_4R_4s}{C_4L_4R_4s^2+L_4s+R_4}, \infty, \infty \right)$$

Parameters:

Q: $C_4R_4\sqrt{\frac{1}{C_4L_4}}$
 wo: $\sqrt{\frac{1}{C_4L_4}}$
 bandwidth: $\frac{1}{C_4R_4}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_4}{2}$
 Qz: 0
 Wz: None

4 LP

5 BS

$$\mathbf{5.1 \quad BS-1} \quad Z(s) = \left(\infty, R_2, \infty, \frac{R_4(C_4L_4s^2+1)}{C_4L_4s^2+C_4R_4s+1}, \infty, \infty \right)$$

Parameters:

Q: $\frac{L_4\sqrt{\frac{1}{C_4L_4}}}{R_4}$
 wo: $\sqrt{\frac{1}{C_4L_4}}$
 bandwidth: $\frac{R_4}{L_4}$
 K-LP: $\frac{R_4}{2}$
 K-HP: $\frac{R_4}{2}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_4L_4}}$

$$\mathbf{5.2 \quad BS-2} \quad Z(s) = \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_4(C_4L_4s^2+1)}{C_4L_4s^2+C_4R_4s+1}, \infty, \infty \right)$$

Parameters:

Q: $\frac{L_4\sqrt{\frac{1}{C_4L_4}}}{R_4}$
 wo: $\sqrt{\frac{1}{C_4L_4}}$
 bandwidth: $\frac{R_4}{L_4}$
 K-LP: $\frac{R_4}{2}$

$$H(s) = \frac{L_4R_4s}{2C_4L_4R_4s^2 + 2L_4s + 2R_4}$$

$$H(s) = \frac{C_4L_4R_4s^2 + R_4}{2C_4L_4s^2 + 2C_4R_4s + 2}$$

$$H(s) = \frac{C_4L_4R_4s^2 + R_4}{2C_4L_4s^2 + 2C_4R_4s + 2}$$

K-HP: $\frac{R_4}{2}$
K-BP: 0
Qz: None
Wz: $\sqrt{\frac{1}{C_4 L_4}}$

$$\mathbf{5.3 \quad BS-3} \quad Z(s) = \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_4(C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + C_4 R_4 s + 1}, \infty, \infty \right)$$

Parameters:

Q: $\frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_4}$
wo: $\sqrt{\frac{1}{C_4 L_4}}$
bandwidth: $\frac{R_4}{L_4}$
K-LP: $\frac{R_4}{2}$
K-HP: $\frac{R_4}{2}$
K-BP: 0
Qz: None
Wz: $\sqrt{\frac{1}{C_4 L_4}}$

$$H(s) = \frac{C_4 L_4 R_4 s^2 + R_4}{2 C_4 L_4 s^2 + 2 C_4 R_4 s + 2}$$

$$\mathbf{5.4 \quad BS-4} \quad Z(s) = \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{R_4(C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + C_4 R_4 s + 1}, \infty, \infty \right)$$

Parameters:

Q: $\frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_4}$
wo: $\sqrt{\frac{1}{C_4 L_4}}$
bandwidth: $\frac{R_4}{L_4}$
K-LP: $\frac{R_4}{2}$
K-HP: $\frac{R_4}{2}$
K-BP: 0
Qz: None
Wz: $\sqrt{\frac{1}{C_4 L_4}}$

$$H(s) = \frac{C_4 L_4 R_4 s^2 + R_4}{2 C_4 L_4 s^2 + 2 C_4 R_4 s + 2}$$

$$\mathbf{5.5 \quad BS-5} \quad Z(s) = \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{R_4(C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + C_4 R_4 s + 1}, \infty, \infty \right)$$

Parameters:

Q: $\frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_4}$
wo: $\sqrt{\frac{1}{C_4 L_4}}$
bandwidth: $\frac{R_4}{L_4}$
K-LP: $\frac{R_4}{2}$
K-HP: $\frac{R_4}{2}$
K-BP: 0
Qz: None
Wz: $\sqrt{\frac{1}{C_4 L_4}}$

$$H(s) = \frac{C_4 L_4 R_4 s^2 + R_4}{2 C_4 L_4 s^2 + 2 C_4 R_4 s + 2}$$

5.6 BS-6 $Z(s) = \left(\infty, L_2 s + R_2 + \frac{1}{C_2 s}, \infty, \frac{R_4(C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + C_4 R_4 s + 1}, \infty, \infty \right)$

Parameters:

Q: $\frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_4}$
 wo: $\sqrt{\frac{1}{C_4 L_4}}$
 bandwidth: $\frac{R_4}{L_4}$
 K-LP: $\frac{R_4}{2}$
 K-HP: $\frac{R_4}{2}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_4 L_4}}$

$$H(s) = \frac{C_4 L_4 R_4 s^2 + R_4}{2 C_4 L_4 s^2 + 2 C_4 R_4 s + 2}$$

5.7 BS-7 $Z(s) = \left(\infty, \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1}, \infty, \frac{R_4(C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + C_4 R_4 s + 1}, \infty, \infty \right)$

Parameters:

Q: $\frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_4}$
 wo: $\sqrt{\frac{1}{C_4 L_4}}$
 bandwidth: $\frac{R_4}{L_4}$
 K-LP: $\frac{R_4}{2}$
 K-HP: $\frac{R_4}{2}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_4 L_4}}$

$$H(s) = \frac{C_4 L_4 R_4 s^2 + R_4}{2 C_4 L_4 s^2 + 2 C_4 R_4 s + 2}$$

5.8 BS-8 $Z(s) = \left(\infty, \frac{R_2(C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \infty, \frac{R_4(C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + C_4 R_4 s + 1}, \infty, \infty \right)$

Parameters:

Q: $\frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_4}$
 wo: $\sqrt{\frac{1}{C_4 L_4}}$
 bandwidth: $\frac{R_4}{L_4}$
 K-LP: $\frac{R_4}{2}$
 K-HP: $\frac{R_4}{2}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_4 L_4}}$

$$H(s) = \frac{C_4 L_4 R_4 s^2 + R_4}{2 C_4 L_4 s^2 + 2 C_4 R_4 s + 2}$$

6 GE

7 AP

8 INVALID-NUMER

9 INVALID-WZ

10 INVALID-ORDER

10.1 INVALID-ORDER-1 $Z(s) = (\infty, R_2, \infty, R_4, \infty, \infty)$

$$H(s) = \frac{R_4}{2}$$

10.2 INVALID-ORDER-2 $Z(s) = \left(\infty, R_2, \infty, \frac{1}{C_4 s}, \infty, \infty\right)$

$$H(s) = \frac{1}{2C_4 s}$$

10.3 INVALID-ORDER-3 $Z(s) = \left(\infty, R_2, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \infty\right)$

$$H(s) = \frac{R_4}{2C_4 R_4 s + 2}$$

10.4 INVALID-ORDER-4 $Z(s) = \left(\infty, R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, \infty\right)$

$$H(s) = \frac{R_2 g_m + s(C_4 R_2 R_4 g_m + C_4 R_4) + 1}{s(2C_4 R_2 g_m + 2C_4)}$$

10.5 INVALID-ORDER-5 $Z(s) = \left(\infty, R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \infty\right)$

$$H(s) = \frac{R_2 g_m + s^2(C_4 L_4 R_2 g_m + C_4 L_4) + 1}{s(2C_4 R_2 g_m + 2C_4)}$$

10.6 INVALID-ORDER-6 $Z(s) = \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \infty\right)$

$$H(s) = \frac{L_4 s}{2C_4 L_4 s^2 + 2}$$

10.7 INVALID-ORDER-7 $Z(s) = \left(\infty, R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \infty\right)$

$$H(s) = \frac{R_2 g_m + s^2(C_4 L_4 R_2 g_m + C_4 L_4) + s(C_4 R_2 R_4 g_m + C_4 R_4) + 1}{s(2C_4 R_2 g_m + 2C_4)}$$

10.8 INVALID-ORDER-8 $Z(s) = \left(\infty, R_2, \infty, \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1}, \infty, \infty\right)$

$$H(s) = \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{2C_4 L_4 s^2 + 2}$$

$$10.9 \quad \text{INVALID-ORDER-9} \quad Z(s) = \left(\infty, \frac{1}{C_2 s}, \infty, R_4, \infty, \infty \right)$$

$$H(s) = \frac{R_4}{2}$$

$$10.10 \quad \text{INVALID-ORDER-10} \quad Z(s) = \left(\infty, \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{1}{2C_4 s}$$

$$10.11 \quad \text{INVALID-ORDER-11} \quad Z(s) = \left(\infty, \frac{1}{C_2 s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \infty \right)$$

$$H(s) = \frac{R_4}{2C_4 R_4 s + 2}$$

$$10.12 \quad \text{INVALID-ORDER-12} \quad Z(s) = \left(\infty, \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{C_2 C_4 R_4 s^2 + g_m + s(C_2 + C_4 R_4 g_m)}{2C_2 C_4 s^2 + 2C_4 g_m s}$$

$$10.13 \quad \text{INVALID-ORDER-13} \quad Z(s) = \left(\infty, \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{C_2 C_4 L_4 s^3 + C_2 s + C_4 L_4 g_m s^2 + g_m}{2C_2 C_4 s^2 + 2C_4 g_m s}$$

$$10.14 \quad \text{INVALID-ORDER-14} \quad Z(s) = \left(\infty, \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \infty \right)$$

$$H(s) = \frac{L_4 s}{2C_4 L_4 s^2 + 2}$$

$$10.15 \quad \text{INVALID-ORDER-15} \quad Z(s) = \left(\infty, \frac{1}{C_2 s}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{C_2 C_4 L_4 s^3 + g_m + s^2(C_2 C_4 R_4 + C_4 L_4 g_m) + s(C_2 + C_4 R_4 g_m)}{2C_2 C_4 s^2 + 2C_4 g_m s}$$

$$10.16 \quad \text{INVALID-ORDER-16} \quad Z(s) = \left(\infty, \frac{1}{C_2 s}, \infty, \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1}, \infty, \infty \right)$$

$$H(s) = \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{2C_4 L_4 s^2 + 2}$$

$$10.17 \quad \text{INVALID-ORDER-17} \quad Z(s) = \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4, \infty, \infty \right)$$

$$H(s) = \frac{R_4}{2}$$

$$10.18 \quad \text{INVALID-ORDER-18} \quad Z(s) = \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{1}{2C_4 s}$$

$$10.19 \quad \text{INVALID-ORDER-19} \quad Z(s) = \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \infty \right)$$

$$H(s) = \frac{R_4}{2C_4 R_4 s + 2}$$

$$10.20 \quad \text{INVALID-ORDER-20} \quad Z(s) = \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{C_2 C_4 R_2 R_4 s^2 + R_2 g_m + s (C_2 R_2 + C_4 R_2 R_4 g_m + C_4 R_4) + 1}{2C_2 C_4 R_2 s^2 + s (2C_4 R_2 g_m + 2C_4)}$$

$$10.21 \quad \text{INVALID-ORDER-21} \quad Z(s) = \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{C_2 C_4 L_4 R_2 s^3 + C_2 R_2 s + R_2 g_m + s^2 (C_4 L_4 R_2 g_m + C_4 L_4) + 1}{2C_2 C_4 R_2 s^2 + s (2C_4 R_2 g_m + 2C_4)}$$

$$10.22 \quad \text{INVALID-ORDER-22} \quad Z(s) = \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \infty \right)$$

$$H(s) = \frac{L_4 s}{2C_4 L_4 s^2 + 2}$$

$$10.23 \quad \text{INVALID-ORDER-23} \quad Z(s) = \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{C_2 C_4 L_4 R_2 s^3 + R_2 g_m + s^2 (C_2 C_4 R_2 R_4 + C_4 L_4 R_2 g_m + C_4 L_4) + s (C_2 R_2 + C_4 R_2 R_4 g_m + C_4 R_4) + 1}{2C_2 C_4 R_2 s^2 + s (2C_4 R_2 g_m + 2C_4)}$$

$$10.24 \quad \text{INVALID-ORDER-24} \quad Z(s) = \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1}, \infty, \infty \right)$$

$$H(s) = \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{2C_4 L_4 s^2 + 2}$$

$$10.25 \quad \text{INVALID-ORDER-25} \quad Z(s) = \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4, \infty, \infty \right)$$

$$H(s) = \frac{R_4}{2}$$

$$10.26 \quad \text{INVALID-ORDER-26} \quad Z(s) = \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{1}{2C_4 s}$$

$$10.27 \quad \text{INVALID-ORDER-27} \quad Z(s) = \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \infty \right)$$

$$H(s) = \frac{R_4}{2C_4 R_4 s + 2}$$

$$10.28 \quad \text{INVALID-ORDER-28} \quad Z(s) = \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{g_m + s^2 (C_2 C_4 R_2 R_4 g_m + C_2 C_4 R_4) + s (C_2 R_2 g_m + C_2 + C_4 R_4 g_m)}{2C_4 g_m s + s^2 (2C_2 C_4 R_2 g_m + 2C_2 C_4)}$$

$$10.29 \quad \text{INVALID-ORDER-29} \quad Z(s) = \left(\infty, \quad R_2 + \frac{1}{C_2 s}, \quad \infty, \quad L_4 s + \frac{1}{C_4 s}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_4 L_4 g_m s^2 + g_m + s^3 (C_2 C_4 L_4 R_2 g_m + C_2 C_4 L_4) + s (C_2 R_2 g_m + C_2)}{2 C_4 g_m s + s^2 (2 C_2 C_4 R_2 g_m + 2 C_2 C_4)}$$

$$10.30 \quad \text{INVALID-ORDER-30} \quad Z(s) = \left(\infty, \quad R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \frac{L_4 s}{C_4 L_4 s^2 + 1}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_4 s}{2 C_4 L_4 s^2 + 2}$$

$$10.31 \quad \text{INVALID-ORDER-31} \quad Z(s) = \left(\infty, \quad R_2 + \frac{1}{C_2 s}, \quad \infty, \quad L_4 s + R_4 + \frac{1}{C_4 s}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{g_m + s^3 (C_2 C_4 L_4 R_2 g_m + C_2 C_4 L_4) + s^2 (C_2 C_4 R_2 R_4 g_m + C_2 C_4 R_4 + C_4 L_4 g_m) + s (C_2 R_2 g_m + C_2 + C_4 R_4 g_m)}{2 C_4 g_m s + s^2 (2 C_2 C_4 R_2 g_m + 2 C_2 C_4)}$$

$$10.32 \quad \text{INVALID-ORDER-32} \quad Z(s) = \left(\infty, \quad R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{2 C_4 L_4 s^2 + 2}$$

$$10.33 \quad \text{INVALID-ORDER-33} \quad Z(s) = \left(\infty, \quad L_2 s + \frac{1}{C_2 s}, \quad \infty, \quad R_4, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_4}{2}$$

$$10.34 \quad \text{INVALID-ORDER-34} \quad Z(s) = \left(\infty, \quad L_2 s + \frac{1}{C_2 s}, \quad \infty, \quad \frac{1}{C_4 s}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{1}{2 C_4 s}$$

$$10.35 \quad \text{INVALID-ORDER-35} \quad Z(s) = \left(\infty, \quad L_2 s + \frac{1}{C_2 s}, \quad \infty, \quad \frac{R_4}{C_4 R_4 s + 1}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_4}{2 C_4 R_4 s + 2}$$

$$10.36 \quad \text{INVALID-ORDER-36} \quad Z(s) = \left(\infty, \quad L_2 s + \frac{1}{C_2 s}, \quad \infty, \quad R_4 + \frac{1}{C_4 s}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2 C_4 L_2 R_4 g_m s^3 + g_m + s^2 (C_2 C_4 R_4 + C_2 L_2 g_m) + s (C_2 + C_4 R_4 g_m)}{2 C_2 C_4 L_2 g_m s^3 + 2 C_2 C_4 s^2 + 2 C_4 g_m s}$$

$$10.37 \quad \text{INVALID-ORDER-37} \quad Z(s) = \left(\infty, \quad L_2 s + \frac{1}{C_2 s}, \quad \infty, \quad L_4 s + \frac{1}{C_4 s}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2 C_4 L_2 L_4 g_m s^4 + C_2 C_4 L_4 s^3 + C_2 s + g_m + s^2 (C_2 L_2 g_m + C_4 L_4 g_m)}{2 C_2 C_4 L_2 g_m s^3 + 2 C_2 C_4 s^2 + 2 C_4 g_m s}$$

$$10.38 \quad \text{INVALID-ORDER-38} \quad Z(s) = \left(\infty, \quad L_2 s + \frac{1}{C_2 s}, \quad \infty, \quad \frac{L_4 s}{C_4 L_4 s^2 + 1}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_4 s}{2 C_4 L_4 s^2 + 2}$$

$$10.39 \quad \text{INVALID-ORDER-39} \quad Z(s) = \left(\infty, \quad L_2s + \frac{1}{C_2s}, \quad \infty, \quad L_4s + R_4 + \frac{1}{C_4s}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2C_4L_2L_4g_ms^4 + g_m + s^3 (C_2C_4L_2R_4g_m + C_2C_4L_4) + s^2 (C_2C_4R_4 + C_2L_2g_m + C_4L_4g_m) + s (C_2 + C_4R_4g_m)}{2C_2C_4L_2g_ms^3 + 2C_2C_4s^2 + 2C_4g_ms}$$

$$10.40 \quad \text{INVALID-ORDER-40} \quad Z(s) = \left(\infty, \quad L_2s + \frac{1}{C_2s}, \quad \infty, \quad \frac{C_4L_4R_4s^2 + L_4s + R_4}{C_4L_4s^2 + 1}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_4L_4R_4s^2 + L_4s + R_4}{2C_4L_4s^2 + 2}$$

$$10.41 \quad \text{INVALID-ORDER-41} \quad Z(s) = \left(\infty, \quad L_2s + R_2 + \frac{1}{C_2s}, \quad \infty, \quad R_4, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_4}{2}$$

$$10.42 \quad \text{INVALID-ORDER-42} \quad Z(s) = \left(\infty, \quad L_2s + R_2 + \frac{1}{C_2s}, \quad \infty, \quad \frac{1}{C_4s}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{1}{2C_4s}$$

$$10.43 \quad \text{INVALID-ORDER-43} \quad Z(s) = \left(\infty, \quad L_2s + R_2 + \frac{1}{C_2s}, \quad \infty, \quad \frac{R_4}{C_4R_4s + 1}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_4}{2C_4R_4s + 2}$$

$$10.44 \quad \text{INVALID-ORDER-44} \quad Z(s) = \left(\infty, \quad L_2s + R_2 + \frac{1}{C_2s}, \quad \infty, \quad R_4 + \frac{1}{C_4s}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2C_4L_2R_4g_ms^3 + g_m + s^2 (C_2C_4R_2R_4g_m + C_2C_4R_4 + C_2L_2g_m) + s (C_2R_2g_m + C_2 + C_4R_4g_m)}{2C_2C_4L_2g_ms^3 + 2C_4g_ms + s^2 (2C_2C_4R_2g_m + 2C_2C_4)}$$

$$10.45 \quad \text{INVALID-ORDER-45} \quad Z(s) = \left(\infty, \quad L_2s + R_2 + \frac{1}{C_2s}, \quad \infty, \quad L_4s + \frac{1}{C_4s}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2C_4L_2L_4g_ms^4 + g_m + s^3 (C_2C_4L_4R_2g_m + C_2C_4L_4) + s^2 (C_2L_2g_m + C_4L_4g_m) + s (C_2R_2g_m + C_2)}{2C_2C_4L_2g_ms^3 + 2C_4g_ms + s^2 (2C_2C_4R_2g_m + 2C_2C_4)}$$

$$10.46 \quad \text{INVALID-ORDER-46} \quad Z(s) = \left(\infty, \quad L_2s + R_2 + \frac{1}{C_2s}, \quad \infty, \quad \frac{L_4s}{C_4L_4s^2 + 1}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_4s}{2C_4L_4s^2 + 2}$$

$$10.47 \quad \text{INVALID-ORDER-47} \quad Z(s) = \left(\infty, \quad L_2s + R_2 + \frac{1}{C_2s}, \quad \infty, \quad L_4s + R_4 + \frac{1}{C_4s}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2C_4L_2L_4g_ms^4 + g_m + s^3 (C_2C_4L_2R_4g_m + C_2C_4L_4R_2g_m + C_2C_4L_4) + s^2 (C_2C_4R_2R_4g_m + C_2C_4R_4 + C_2L_2g_m + C_4L_4g_m) + s (C_2R_2g_m + C_2 + C_4R_4g_m)}{2C_2C_4L_2g_ms^3 + 2C_4g_ms + s^2 (2C_2C_4R_2g_m + 2C_2C_4)}$$

$$10.48 \quad \text{INVALID-ORDER-48} \quad Z(s) = \left(\infty, \quad L_2s + R_2 + \frac{1}{C_2s}, \quad \infty, \quad \frac{C_4L_4R_4s^2 + L_4s + R_4}{C_4L_4s^2 + 1}, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_4L_4R_4s^2 + L_4s + R_4}{2C_4L_4s^2 + 2}$$

$$10.49 \quad \text{INVALID-ORDER-49} \quad Z(s) = \left(\infty, \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1}, \infty, R_4, \infty, \infty \right)$$

$$H(s) = \frac{R_4}{2}$$

$$10.50 \quad \text{INVALID-ORDER-50} \quad Z(s) = \left(\infty, \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1}, \infty, \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{1}{2C_4 s}$$

$$10.51 \quad \text{INVALID-ORDER-51} \quad Z(s) = \left(\infty, \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \infty \right)$$

$$H(s) = \frac{R_4}{2C_4 R_4 s + 2}$$

$$10.52 \quad \text{INVALID-ORDER-52} \quad Z(s) = \left(\infty, \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{R_2 g_m + s^3 (C_2 C_4 L_2 R_2 R_4 g_m + C_2 C_4 L_2 R_4) + s^2 (C_2 L_2 R_2 g_m + C_2 L_2 + C_4 L_2 R_4 g_m) + s (C_4 R_2 R_4 g_m + C_4 R_4 + L_2 g_m) + 1}{2C_4 L_2 g_m s^2 + s^3 (2C_2 C_4 L_2 R_2 g_m + 2C_2 C_4 L_2) + s (2C_4 R_2 g_m + 2C_4)}$$

$$10.53 \quad \text{INVALID-ORDER-53} \quad Z(s) = \left(\infty, \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{C_4 L_2 L_4 g_m s^3 + L_2 g_m s + R_2 g_m + s^4 (C_2 C_4 L_2 L_4 R_2 g_m + C_2 C_4 L_2 L_4) + s^2 (C_2 L_2 R_2 g_m + C_2 L_2 + C_4 L_4 R_2 g_m + C_4 L_4) + 1}{2C_4 L_2 g_m s^2 + s^3 (2C_2 C_4 L_2 R_2 g_m + 2C_2 C_4 L_2) + s (2C_4 R_2 g_m + 2C_4)}$$

$$10.54 \quad \text{INVALID-ORDER-54} \quad Z(s) = \left(\infty, \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \infty \right)$$

$$H(s) = \frac{L_4 s}{2C_4 L_4 s^2 + 2}$$

$$10.55 \quad \text{INVALID-ORDER-55} \quad Z(s) = \left(\infty, \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{R_2 g_m + s^4 (C_2 C_4 L_2 L_4 R_2 g_m + C_2 C_4 L_2 L_4) + s^3 (C_2 C_4 L_2 R_2 R_4 g_m + C_2 C_4 L_2 R_4 + C_4 L_2 L_4 g_m) + s^2 (C_2 L_2 R_2 g_m + C_2 L_2 + C_4 L_2 R_4 g_m + C_4 L_4 R_2 g_m + C_4 L_4) + s (C_4 R_2 R_4 g_m + C_4 R_4 + L_2 g_m) + 1}{2C_4 L_2 g_m s^2 + s^3 (2C_2 C_4 L_2 R_2 g_m + 2C_2 C_4 L_2) + s (2C_4 R_2 g_m + 2C_4)}$$

$$10.56 \quad \text{INVALID-ORDER-56} \quad Z(s) = \left(\infty, \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1}, \infty, \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1}, \infty, \infty \right)$$

$$H(s) = \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{2C_4 L_4 s^2 + 2}$$

$$10.57 \quad \text{INVALID-ORDER-57} \quad Z(s) = \left(\infty, \frac{R_2 (C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \infty, R_4, \infty, \infty \right)$$

$$H(s) = \frac{R_4}{2}$$

$$10.58 \quad \text{INVALID-ORDER-58} \quad Z(s) = \left(\infty, \frac{R_2 (C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s}, \infty, \infty \right)$$

$$H(s) = \frac{1}{2C_4 s}$$

$$10.59 \quad \text{INVALID-ORDER-59} \quad Z(s) = \left(\infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \infty \right)$$

$$H(s) = \frac{R_4}{2C_4R_4s+2}$$

$$10.60 \quad \text{INVALID-ORDER-60} \quad Z(s) = \left(\infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, R_4 + \frac{1}{C_4s}, \infty, \infty \right)$$

$$H(s) = \frac{R_2g_m + s^3(C_2C_4L_2R_2R_4g_m + C_2C_4L_2R_4) + s^2(C_2C_4R_2R_4 + C_2L_2R_2g_m + C_2L_2) + s(C_2R_2 + C_4R_2R_4g_m + C_4R_4) + 1}{2C_2C_4R_2s^2 + s^3(2C_2C_4L_2R_2g_m + 2C_2C_4L_2) + s(2C_4R_2g_m + 2C_4)}$$

$$10.61 \quad \text{INVALID-ORDER-61} \quad Z(s) = \left(\infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, L_4s + \frac{1}{C_4s}, \infty, \infty \right)$$

$$H(s) = \frac{C_2C_4L_4R_2s^3 + C_2R_2s + R_2g_m + s^4(C_2C_4L_2L_4R_2g_m + C_2C_4L_2L_4) + s^2(C_2L_2R_2g_m + C_2L_2 + C_4L_4R_2g_m + C_4L_4) + 1}{2C_2C_4R_2s^2 + s^3(2C_2C_4L_2R_2g_m + 2C_2C_4L_2) + s(2C_4R_2g_m + 2C_4)}$$

$$10.62 \quad \text{INVALID-ORDER-62} \quad Z(s) = \left(\infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \infty \right)$$

$$H(s) = \frac{L_4s}{2C_4L_4s^2+2}$$

$$10.63 \quad \text{INVALID-ORDER-63} \quad Z(s) = \left(\infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \infty \right)$$

$$H(s) = \frac{R_2g_m + s^4(C_2C_4L_2L_4R_2g_m + C_2C_4L_2L_4) + s^3(C_2C_4L_2R_2R_4g_m + C_2C_4L_2R_4 + C_2C_4L_4R_2) + s^2(C_2C_4R_2R_4 + C_2L_2R_2g_m + C_2L_2 + C_4L_4R_2g_m + C_4L_4) + s(C_2R_2 + C_4R_2R_4g_m + C_4R_4) + 1}{2C_2C_4R_2s^2 + s^3(2C_2C_4L_2R_2g_m + 2C_2C_4L_2) + s(2C_4R_2g_m + 2C_4)}$$

$$10.64 \quad \text{INVALID-ORDER-64} \quad Z(s) = \left(\infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, \frac{C_4L_4R_4s^2+L_4s+R_4}{C_4L_4s^2+1}, \infty, \infty \right)$$

$$H(s) = \frac{C_4L_4R_4s^2 + L_4s + R_4}{2C_4L_4s^2+2}$$

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