

Filter Summary Report: TIA,simple,Z1,ZL

Generated by MacAnalog-Symbolix

December 7, 2024

Contents

1	Examined $H(z)$ for TIA simple Z1 ZL: $\frac{Z_1 Z_L g_m}{Z_1 g_m + 1}$	5
2	HP	5
3	BP	5
3.1	BP-1 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_1 s}} \right)$	5
3.2	BP-2 $Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$	5
3.3	BP-3 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, R_L \right)$	5
3.4	BP-4 $Z(s) = \left(\frac{1}{C_1 s + \frac{1}{R_1} + \frac{1}{L_1 s}}, \infty, \infty, \infty, \infty, R_L \right)$	6
4	LP	6
4.1	LP-1 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$	6
4.2	LP-2 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$	6
4.3	LP-3 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$	7
4.4	LP-4 $Z(s) = \left(\frac{1}{C_1 s + \frac{1}{R_1} + \frac{1}{L_1 s}}, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$	7
5	BS	7
5.1	BS-1 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$	7
5.2	BS-2 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L \right)$	8
5.3	BS-3 $Z(s) = \left(\frac{R_1 (L_1 s + \frac{1}{C_1 s})}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, R_L \right)$	8
6	GE	8
6.1	GE-1 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L \right)$	8
6.2	GE-2 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, R_L \right)$	9
7	AP	9
8	INVALID-NUMER	9
8.1	INVALID-NUMER-1 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$	9
8.2	INVALID-NUMER-2 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$	9
8.3	INVALID-NUMER-3 $Z(s) = \left(\frac{1}{C_1 s + \frac{1}{R_1} + \frac{1}{L_1 s}}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$	10
9	INVALID-WZ	10
9.1	INVALID-WZ-1 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$	10
9.2	INVALID-WZ-2 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$	10
9.3	INVALID-WZ-3 $Z(s) = \left(\frac{1}{C_1 s + \frac{1}{R_1} + \frac{1}{L_1 s}}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$	11
9.4	INVALID-WZ-4 $Z(s) = \left(\frac{1}{C_1 s + \frac{1}{R_1} + \frac{1}{L_1 s}}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$	11

10 INVALID-ORDER

11

10.1 INVALID-ORDER-1 $Z(s) = (R_1, \infty, \infty, \infty, \infty, R_L)$	11
10.2 INVALID-ORDER-2 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{1}{C_L s}\right)$	11
10.3 INVALID-ORDER-3 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1}\right)$	11
10.4 INVALID-ORDER-4 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s}\right)$	12
10.5 INVALID-ORDER-5 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s}\right)$	12
10.6 INVALID-ORDER-6 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1}\right)$	12
10.7 INVALID-ORDER-7 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s}\right)$	12
10.8 INVALID-ORDER-8 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$	12
10.9 INVALID-ORDER-9 $Z(s) = (L_1 s, \infty, \infty, \infty, \infty, R_L)$	12
10.10INVALID-ORDER-10 $Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{1}{C_L s}\right)$	12
10.11INVALID-ORDER-11 $Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s}\right)$	12
10.12INVALID-ORDER-12 $Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s}\right)$	12
10.13INVALID-ORDER-13 $Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1}\right)$	12
10.14INVALID-ORDER-14 $Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s}\right)$	13
10.15INVALID-ORDER-15 $Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}}\right)$	13
10.16INVALID-ORDER-16 $Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$	13
10.17INVALID-ORDER-17 $Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s}\right)}{L_L s + R_L + \frac{1}{C_L s}}\right)$	13
10.18INVALID-ORDER-18 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L\right)$	13
10.19INVALID-ORDER-19 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{1}{C_L s}\right)$	13
10.20INVALID-ORDER-20 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s}\right)$	13
10.21INVALID-ORDER-21 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s}\right)$	13
10.22INVALID-ORDER-22 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1}\right)$	13
10.23INVALID-ORDER-23 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s}\right)$	14
10.24INVALID-ORDER-24 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}}\right)$	14
10.25INVALID-ORDER-25 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$	14
10.26INVALID-ORDER-26 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s}\right)}{L_L s + R_L + \frac{1}{C_L s}}\right)$	14
10.27INVALID-ORDER-27 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, R_L\right)$	14
10.28INVALID-ORDER-28 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{1}{C_L s}\right)$	14
10.29INVALID-ORDER-29 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s}\right)$	14
10.30INVALID-ORDER-30 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s}\right)$	14
10.31INVALID-ORDER-31 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1}\right)$	14
10.32INVALID-ORDER-32 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s}\right)$	15
10.33INVALID-ORDER-33 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}}\right)$	15
10.34INVALID-ORDER-34 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$	15
10.35INVALID-ORDER-35 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s}\right)}{L_L s + R_L + \frac{1}{C_L s}}\right)$	15
10.36INVALID-ORDER-36 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L\right)$	15
10.37INVALID-ORDER-37 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{1}{C_L s}\right)$	15
10.38INVALID-ORDER-38 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s}\right)$	15

10.75INVALID-ORDER-75	$Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$	19
10.76INVALID-ORDER-76	$Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$	19
10.77INVALID-ORDER-77	$Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$	20
10.78INVALID-ORDER-78	$Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$	20
10.79INVALID-ORDER-79	$Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$	20
10.80INVALID-ORDER-80	$Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$	20
10.81INVALID-ORDER-81	$Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$	20
10.82INVALID-ORDER-82	$Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$	20
10.83INVALID-ORDER-83	$Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$	20
10.84INVALID-ORDER-84	$Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$	20
10.85INVALID-ORDER-85	$Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$	20
10.86INVALID-ORDER-86	$Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$	21
10.87INVALID-ORDER-87	$Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$	21
10.88INVALID-ORDER-88	$Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$	21
10.89INVALID-ORDER-89	$Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$	21
10.90INVALID-ORDER-90	$Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$	21

1 Examined $H(z)$ for TIA simple Z1 ZL: $\frac{Z_1 Z_L g_m}{Z_1 g_m + 1}$

$$H(z) = \frac{Z_1 Z_L g_m}{Z_1 g_m + 1}$$

2 HP

3 BP

3.1 BP-1 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{L_L R_L s}{C_L L_L R_L s^2 + L_L s + R_L} \right)$

$$H(s) = \frac{L_L R_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

Parameters:

Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{1}{C_L R_L}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 Qz: 0
 Wz: None

3.2 BP-2 $Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{L_L R_L s}{C_L L_L R_L s^2 + L_L s + R_L} \right)$

$$H(s) = \frac{L_L R_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

Parameters:

Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{1}{C_L R_L}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 Qz: 0
 Wz: None

3.3 BP-3 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L R_L s}{C_L L_L R_L s^2 + L_L s + R_L} \right)$

$$H(s) = \frac{L_L R_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

Parameters:

Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{1}{C_L R_L}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 Qz: 0
 Wz: None

3.4 BP-4 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{L_L R_L s}{C_L L_L R_L s^2 + L_L s + R_L} \right)$

Parameters:

Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{1}{C_L R_L}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 Qz: 0
 Wz: None

3.5 BP-5 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L R_L s}{C_L L_L R_L s^2 + L_L s + R_L} \right)$

Parameters:

Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{1}{C_L R_L}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 Qz: 0
 Wz: None

3.6 BP-6 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L R_L s}{C_L L_L R_L s^2 + L_L s + R_L} \right)$

Parameters:

Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{1}{C_L R_L}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 Qz: 0
 Wz: None

3.7 BP-7 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, \frac{L_L R_L s}{C_L L_L R_L s^2 + L_L s + R_L} \right)$

Parameters:

Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$

$$H(s) = \frac{L_L R_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

$$H(s) = \frac{L_L R_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

$$H(s) = \frac{L_L R_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

$$H(s) = \frac{L_L R_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

bandwidth: $\frac{1}{C_L R_L}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
Qz: 0
Wz: None

3.8 BP-8 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L R_L s}{C_L L_L R_L s^2 + L_L s + R_L} \right)$

Parameters:

Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
wo: $\sqrt{\frac{1}{C_L L_L}}$
bandwidth: $\frac{1}{C_L R_L}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
Qz: 0
Wz: None

3.9 BP-9 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, \infty, \infty, \infty, \frac{L_L R_L s}{C_L L_L R_L s^2 + L_L s + R_L} \right)$

Parameters:

Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
wo: $\sqrt{\frac{1}{C_L L_L}}$
bandwidth: $\frac{1}{C_L R_L}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
Qz: 0
Wz: None

3.10 BP-10 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{L_L R_L s}{C_L L_L R_L s^2 + L_L s + R_L} \right)$

Parameters:

Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
wo: $\sqrt{\frac{1}{C_L L_L}}$
bandwidth: $\frac{1}{C_L R_L}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
Qz: 0
Wz: None

$$H(s) = \frac{L_L R_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

$$H(s) = \frac{L_L R_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

$$H(s) = \frac{L_L R_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

3.11 BP-11 $Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{L_L R_L s}{C_L L_L R_L s^2 + L_L s + R_L} \right)$

Parameters:

Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{1}{C_L R_L}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 Qz: 0
 Wz: None

4 LP

5 BS

5.1 BS-1 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{R_L(C_L L_L s^2 + 1)}{C_L L_L s^2 + C_L R_L s + 1} \right)$

Parameters:

Q: $\frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{R_L}{L_L}$
 K-LP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 K-HP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_L L_L}}$

5.2 BS-2 $Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{R_L(C_L L_L s^2 + 1)}{C_L L_L s^2 + C_L R_L s + 1} \right)$

Parameters:

Q: $\frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{R_L}{L_L}$
 K-LP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 K-HP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_L L_L}}$

$$H(s) = \frac{L_L R_L Z_1 g_m s}{(Z_1 g_m + 1)(C_L L_L R_L s^2 + L_L s + R_L)}$$

$$H(s) = \frac{R_L Z_1 g_m (C_L L_L s^2 + 1)}{(Z_1 g_m + 1)(C_L L_L s^2 + C_L R_L s + 1)}$$

$$H(s) = \frac{R_L Z_1 g_m (C_L L_L s^2 + 1)}{(Z_1 g_m + 1)(C_L L_L s^2 + C_L R_L s + 1)}$$

5.3 BS-3 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{R_L(C_L L_L s^2 + 1)}{C_L L_L s^2 + C_L R_L s + 1} \right)$

Parameters:

Q: $\frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{R_L}{L_L}$
 K-LP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 K-HP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_L L_L}}$

5.4 BS-4 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{R_L(C_L L_L s^2 + 1)}{C_L L_L s^2 + C_L R_L s + 1} \right)$

Parameters:

Q: $\frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{R_L}{L_L}$
 K-LP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 K-HP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_L L_L}}$

5.5 BS-5 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{R_L(C_L L_L s^2 + 1)}{C_L L_L s^2 + C_L R_L s + 1} \right)$

Parameters:

Q: $\frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L}$
 wo: $\sqrt{\frac{1}{C_L L_L}}$
 bandwidth: $\frac{R_L}{L_L}$
 K-LP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 K-HP: $\frac{R_L Z_1 g_m}{Z_1 g_m + 1}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_L L_L}}$

$$H(s) = \frac{R_L Z_1 g_m (C_L L_L s^2 + 1)}{(Z_1 g_m + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

$$H(s) = \frac{R_L Z_1 g_m (C_L L_L s^2 + 1)}{(Z_1 g_m + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

$$H(s) = \frac{R_L Z_1 g_m (C_L L_L s^2 + 1)}{(Z_1 g_m + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

$$\mathbf{5.6 \quad BS-6} \quad Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{R_L(C_L L_L s^2 + 1)}{C_L L_L s^2 + C_L R_L s + 1} \right)$$

Parameters:

$$\begin{aligned} \text{Q: } & \frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L} \\ \text{wo: } & \sqrt{\frac{1}{C_L L_L}} \\ \text{bandwidth: } & \frac{R_L}{L_L} \\ \text{K-LP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-HP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-BP: } & 0 \\ \text{Qz: } & \text{None} \\ \text{Wz: } & \sqrt{\frac{1}{C_L L_L}} \end{aligned}$$

$$\mathbf{5.7 \quad BS-7} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{R_L(C_L L_L s^2 + 1)}{C_L L_L s^2 + C_L R_L s + 1} \right)$$

Parameters:

$$\begin{aligned} \text{Q: } & \frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L} \\ \text{wo: } & \sqrt{\frac{1}{C_L L_L}} \\ \text{bandwidth: } & \frac{R_L}{L_L} \\ \text{K-LP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-HP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-BP: } & 0 \\ \text{Qz: } & \text{None} \\ \text{Wz: } & \sqrt{\frac{1}{C_L L_L}} \end{aligned}$$

$$\mathbf{5.8 \quad BS-8} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{R_L(C_L L_L s^2 + 1)}{C_L L_L s^2 + C_L R_L s + 1} \right)$$

Parameters:

$$\begin{aligned} \text{Q: } & \frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L} \\ \text{wo: } & \sqrt{\frac{1}{C_L L_L}} \\ \text{bandwidth: } & \frac{R_L}{L_L} \\ \text{K-LP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-HP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-BP: } & 0 \\ \text{Qz: } & \text{None} \\ \text{Wz: } & \sqrt{\frac{1}{C_L L_L}} \end{aligned}$$

$$H(s) = \frac{R_L Z_1 g_m (C_L L_L s^2 + 1)}{(Z_1 g_m + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

$$H(s) = \frac{R_L Z_1 g_m (C_L L_L s^2 + 1)}{(Z_1 g_m + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

$$H(s) = \frac{R_L Z_1 g_m (C_L L_L s^2 + 1)}{(Z_1 g_m + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

$$\mathbf{5.9 \quad BS-9} \quad Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{R_L (C_L L_L s^2 + 1)}{C_L L_L s^2 + C_L R_L s + 1} \right)$$

Parameters:

$$\begin{aligned} \text{Q: } & \frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L} \\ \text{wo: } & \sqrt{\frac{1}{C_L L_L}} \\ \text{bandwidth: } & \frac{R_L}{L_L} \\ \text{K-LP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-HP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-BP: } & 0 \\ \text{Qz: } & \text{None} \\ \text{Wz: } & \sqrt{\frac{1}{C_L L_L}} \end{aligned}$$

$$\mathbf{5.10 \quad BS-10} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{R_L (C_L L_L s^2 + 1)}{C_L L_L s^2 + C_L R_L s + 1} \right)$$

Parameters:

$$\begin{aligned} \text{Q: } & \frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L} \\ \text{wo: } & \sqrt{\frac{1}{C_L L_L}} \\ \text{bandwidth: } & \frac{R_L}{L_L} \\ \text{K-LP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-HP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-BP: } & 0 \\ \text{Qz: } & \text{None} \\ \text{Wz: } & \sqrt{\frac{1}{C_L L_L}} \end{aligned}$$

$$\mathbf{5.11 \quad BS-11} \quad Z(s) = \left(\frac{R_1 (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{R_L (C_L L_L s^2 + 1)}{C_L L_L s^2 + C_L R_L s + 1} \right)$$

Parameters:

$$\begin{aligned} \text{Q: } & \frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L} \\ \text{wo: } & \sqrt{\frac{1}{C_L L_L}} \\ \text{bandwidth: } & \frac{R_L}{L_L} \\ \text{K-LP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-HP: } & \frac{R_L Z_1 g_m}{Z_1 g_m + 1} \\ \text{K-BP: } & 0 \\ \text{Qz: } & \text{None} \\ \text{Wz: } & \sqrt{\frac{1}{C_L L_L}} \end{aligned}$$

6 GE

7 AP

$$H(s) = \frac{R_L Z_1 g_m (C_L L_L s^2 + 1)}{(Z_1 g_m + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

$$H(s) = \frac{R_L Z_1 g_m (C_L L_L s^2 + 1)}{(Z_1 g_m + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

$$H(s) = \frac{R_L Z_1 g_m (C_L L_L s^2 + 1)}{(Z_1 g_m + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

8 INVALID-NUMER

9 INVALID-WZ

10 INVALID-ORDER

10.1 INVALID-ORDER-1 $Z(s) = (R_1, \infty, \infty, \infty, \infty, R_L)$

$$H(s) = \frac{R_L Z_1 g_m}{Z_1 g_m + 1}$$

10.2 INVALID-ORDER-2 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{1}{C_L s}\right)$

$$H(s) = \frac{Z_1 g_m}{C_L s (Z_1 g_m + 1)}$$

10.3 INVALID-ORDER-3 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1}\right)$

$$H(s) = \frac{R_L Z_1 g_m}{(Z_1 g_m + 1)(C_L R_L s + 1)}$$

10.4 INVALID-ORDER-4 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s}\right)$

$$H(s) = \frac{Z_1 g_m (C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

10.5 INVALID-ORDER-5 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s}\right)$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + 1)}{C_L s (Z_1 g_m + 1)}$$

10.6 INVALID-ORDER-6 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1}\right)$

$$H(s) = \frac{L_L Z_1 g_m s}{(Z_1 g_m + 1)(C_L L_L s^2 + 1)}$$

10.7 INVALID-ORDER-7 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s}\right)$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

10.8 INVALID-ORDER-8 $Z(s) = \left(R_1, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$

$$H(s) = \frac{Z_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(Z_1 g_m + 1)(C_L L_L s^2 + 1)}$$

$$10.9 \quad \text{INVALID-ORDER-9} \quad Z(s) = (L_1 s, \infty, \infty, \infty, \infty, R_L)$$

$$H(s) = \frac{R_L Z_1 g_m}{Z_1 g_m + 1}$$

$$10.10 \quad \text{INVALID-ORDER-10} \quad Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m}{C_L s (Z_1 g_m + 1)}$$

$$10.11 \quad \text{INVALID-ORDER-11} \quad Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{(Z_1 g_m + 1) (C_L R_L s + 1)}$$

$$10.12 \quad \text{INVALID-ORDER-12} \quad Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.13 \quad \text{INVALID-ORDER-13} \quad Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.14 \quad \text{INVALID-ORDER-14} \quad Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s) = \frac{L_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$10.15 \quad \text{INVALID-ORDER-15} \quad Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.16 \quad \text{INVALID-ORDER-16} \quad Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$10.17 \quad \text{INVALID-ORDER-17} \quad Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{Z_1 g_m + 1}$$

$$10.18 \quad \text{INVALID-ORDER-18} \quad Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m}{C_L s (Z_1 g_m + 1)}$$

$$10.19 \quad \text{INVALID-ORDER-19} \quad Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{(Z_1 g_m + 1)(C_L R_L s + 1)}$$

$$10.20 \quad \text{INVALID-ORDER-20} \quad Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.21 \quad \text{INVALID-ORDER-21} \quad Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.22 \quad \text{INVALID-ORDER-22} \quad Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s) = \frac{L_L Z_1 g_m s}{(Z_1 g_m + 1)(C_L L_L s^2 + 1)}$$

$$10.23 \quad \text{INVALID-ORDER-23} \quad Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.24 \quad \text{INVALID-ORDER-24} \quad Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(Z_1 g_m + 1)(C_L L_L s^2 + 1)}$$

$$10.25 \quad \text{INVALID-ORDER-25} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, R_L \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{Z_1 g_m + 1}$$

$$10.26 \quad \text{INVALID-ORDER-26} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m}{C_L s (Z_1 g_m + 1)}$$

$$10.27 \quad \text{INVALID-ORDER-27} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{(Z_1 g_m + 1)(C_L R_L s + 1)}$$

$$10.28 \quad \text{INVALID-ORDER-28} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$\textbf{10.29} \quad \textbf{INVALID-ORDER-29} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad L_L s + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + 1)}{C_L s (Z_1 g_m + 1)}$$

$$\textbf{10.30} \quad \textbf{INVALID-ORDER-30} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s) = \frac{L_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$\textbf{10.31} \quad \textbf{INVALID-ORDER-31} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$\textbf{10.32} \quad \textbf{INVALID-ORDER-32} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$\textbf{10.33} \quad \textbf{INVALID-ORDER-33} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad R_L \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{Z_1 g_m + 1}$$

$$\textbf{10.34} \quad \textbf{INVALID-ORDER-34} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m}{C_L s (Z_1 g_m + 1)}$$

$$\textbf{10.35} \quad \textbf{INVALID-ORDER-35} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{(Z_1 g_m + 1) (C_L R_L s + 1)}$$

$$\textbf{10.36} \quad \textbf{INVALID-ORDER-36} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$\textbf{10.37} \quad \textbf{INVALID-ORDER-37} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad L_L s + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + 1)}{C_L s (Z_1 g_m + 1)}$$

$$\textbf{10.38} \quad \textbf{INVALID-ORDER-38} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s) = \frac{L_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$10.39 \quad \text{INVALID-ORDER-39} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.40 \quad \text{INVALID-ORDER-40} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$10.41 \quad \text{INVALID-ORDER-41} \quad Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad R_L \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{Z_1 g_m + 1}$$

$$10.42 \quad \text{INVALID-ORDER-42} \quad Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m}{C_L s (Z_1 g_m + 1)}$$

$$10.43 \quad \text{INVALID-ORDER-43} \quad Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{(Z_1 g_m + 1) (C_L R_L s + 1)}$$

$$10.44 \quad \text{INVALID-ORDER-44} \quad Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.45 \quad \text{INVALID-ORDER-45} \quad Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad L_L s + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.46 \quad \text{INVALID-ORDER-46} \quad Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s) = \frac{L_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$10.47 \quad \text{INVALID-ORDER-47} \quad Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.48 \quad \text{INVALID-ORDER-48} \quad Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$10.49 \quad \text{INVALID-ORDER-49} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, R_L \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{Z_1 g_m + 1}$$

$$10.50 \quad \text{INVALID-ORDER-50} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m}{C_L s (Z_1 g_m + 1)}$$

$$10.51 \quad \text{INVALID-ORDER-51} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{(Z_1 g_m + 1) (C_L R_L s + 1)}$$

$$10.52 \quad \text{INVALID-ORDER-52} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.53 \quad \text{INVALID-ORDER-53} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.54 \quad \text{INVALID-ORDER-54} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s) = \frac{L_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$10.55 \quad \text{INVALID-ORDER-55} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.56 \quad \text{INVALID-ORDER-56} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$10.57 \quad \text{INVALID-ORDER-57} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{Z_1 g_m + 1}$$

$$10.58 \quad \text{INVALID-ORDER-58} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m}{C_L s (Z_1 g_m + 1)}$$

$$10.59 \quad \text{INVALID-ORDER-59} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{(Z_1 g_m + 1)(C_L R_L s + 1)}$$

$$10.60 \quad \text{INVALID-ORDER-60} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.61 \quad \text{INVALID-ORDER-61} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad L_L s + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.62 \quad \text{INVALID-ORDER-62} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s) = \frac{L_L Z_1 g_m s}{(Z_1 g_m + 1)(C_L L_L s^2 + 1)}$$

$$10.63 \quad \text{INVALID-ORDER-63} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.64 \quad \text{INVALID-ORDER-64} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(Z_1 g_m + 1)(C_L L_L s^2 + 1)}$$

$$10.65 \quad \text{INVALID-ORDER-65} \quad Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad R_L \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{Z_1 g_m + 1}$$

$$10.66 \quad \text{INVALID-ORDER-66} \quad Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m}{C_L s (Z_1 g_m + 1)}$$

$$10.67 \quad \text{INVALID-ORDER-67} \quad Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{(Z_1 g_m + 1)(C_L R_L s + 1)}$$

$$10.68 \quad \text{INVALID-ORDER-68} \quad Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.69 \quad \text{INVALID-ORDER-69} \quad Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.70 \quad \text{INVALID-ORDER-70} \quad Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s) = \frac{L_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$10.71 \quad \text{INVALID-ORDER-71} \quad Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.72 \quad \text{INVALID-ORDER-72} \quad Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$10.73 \quad \text{INVALID-ORDER-73} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, R_L \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{Z_1 g_m + 1}$$

$$10.74 \quad \text{INVALID-ORDER-74} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m}{C_L s (Z_1 g_m + 1)}$$

$$10.75 \quad \text{INVALID-ORDER-75} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{(Z_1 g_m + 1) (C_L R_L s + 1)}$$

$$10.76 \quad \text{INVALID-ORDER-76} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.77 \quad \text{INVALID-ORDER-77} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + 1)}{C_L s (Z_1 g_m + 1)}$$

$$10.78 \quad \text{INVALID-ORDER-78} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s) = \frac{L_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$\mathbf{10.79 \quad INVALID-ORDER-79} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$\mathbf{10.80 \quad INVALID-ORDER-80} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$\mathbf{10.81 \quad INVALID-ORDER-81} \quad Z(s) = \left(\frac{R_1 (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad R_L \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{Z_1 g_m + 1}$$

$$\mathbf{10.82 \quad INVALID-ORDER-82} \quad Z(s) = \left(\frac{R_1 (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m}{C_L s (Z_1 g_m + 1)}$$

$$\mathbf{10.83 \quad INVALID-ORDER-83} \quad Z(s) = \left(\frac{R_1 (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s) = \frac{R_L Z_1 g_m}{(Z_1 g_m + 1) (C_L R_L s + 1)}$$

$$\mathbf{10.84 \quad INVALID-ORDER-84} \quad Z(s) = \left(\frac{R_1 (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

$$\mathbf{10.85 \quad INVALID-ORDER-85} \quad Z(s) = \left(\frac{R_1 (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad L_L s + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + 1)}{C_L s (Z_1 g_m + 1)}$$

$$\mathbf{10.86 \quad INVALID-ORDER-86} \quad Z(s) = \left(\frac{R_1 (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s) = \frac{L_L Z_1 g_m s}{(Z_1 g_m + 1) (C_L L_L s^2 + 1)}$$

$$\mathbf{10.87 \quad INVALID-ORDER-87} \quad Z(s) = \left(\frac{R_1 (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty, \quad L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s) = \frac{Z_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (Z_1 g_m + 1)}$$

10.88 INVALID-ORDER-88

$$Z(s) = \left(\frac{R_1(C_1L_1s^2+1)}{C_1L_1s^2+C_1R_1s+1}, \infty, \infty, \infty, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$

$$H(s) = \frac{Z_1g_m\left(C_LL_LR_Ls^2+L_Ls+R_L\right)}{\left(Z_1g_m+1\right)\left(C_LL_Ls^2+1\right)}$$