

Filter Summary Report: TIA,simple,Z1,Z3

Generated by MacAnalog-Symbolix

December 18, 2024

Contents

1	Examined $H(z)$ for TIA simple Z1 Z3: $\frac{Z_1 Z_3 g_m}{Z_1 g_m + 1}$	5
2	HP	5
3	BP	5
3.1	BP-1 $Z(s) = \left(R_1, \infty, \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \infty, \infty, \infty \right)$	5
3.2	BP-2 $Z(s) = \left(L_1 s, \infty, \frac{R_3}{C_3 R_3 s + 1}, \infty, \infty, \infty \right)$	5
3.3	BP-3 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, R_3, \infty, \infty, \infty \right)$	5
3.4	BP-4 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, R_3, \infty, \infty, \infty \right)$	6
4	LP	6
4.1	LP-1 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \frac{R_3}{C_3 R_3 s + 1}, \infty, \infty, \infty \right)$	6
4.2	LP-2 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \frac{R_3}{C_3 R_3 s + 1}, \infty, \infty, \infty \right)$	6
4.3	LP-3 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	7
4.4	LP-4 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	7
5	BS	7
5.1	BS-1 $Z(s) = \left(R_1, \infty, \frac{R_3 (C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \infty, \infty, \infty \right)$	7
5.2	BS-2 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, R_3, \infty, \infty, \infty \right)$	8
5.3	BS-3 $Z(s) = \left(\frac{R_1 (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, R_3, \infty, \infty, \infty \right)$	8
6	GE	8
6.1	GE-1 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, R_3, \infty, \infty, \infty \right)$	8
6.2	GE-2 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, R_3, \infty, \infty, \infty \right)$	9
7	AP	9
8	INVALID-NUMER	9
8.1	INVALID-NUMER-1 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \frac{R_3}{C_3 R_3 s + 1}, \infty, \infty, \infty \right)$	9
8.2	INVALID-NUMER-2 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	9
8.3	INVALID-NUMER-3 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	10
9	INVALID-WZ	10
9.1	INVALID-WZ-1 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	10
9.2	INVALID-WZ-2 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, L_3 s + R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	10
9.3	INVALID-WZ-3 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	11
9.4	INVALID-WZ-4 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, L_3 s + R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	11

10 INVALID-ORDER

11

10.1 INVALID-ORDER-1	$Z(s) = (R_1, \infty, R_3, \infty, \infty, \infty)$	11
10.2 INVALID-ORDER-2	$Z(s) = \left(R_1, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	11
10.3 INVALID-ORDER-3	$Z(s) = \left(R_1, \infty, \frac{R_3}{C_3 R_3 s + 1}, \infty, \infty, \infty\right)$	11
10.4 INVALID-ORDER-4	$Z(s) = \left(R_1, \infty, R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	12
10.5 INVALID-ORDER-5	$Z(s) = \left(R_1, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	12
10.6 INVALID-ORDER-6	$Z(s) = \left(R_1, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1}, \infty, \infty, \infty\right)$	12
10.7 INVALID-ORDER-7	$Z(s) = \left(R_1, \infty, L_3 s + R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	12
10.8 INVALID-ORDER-8	$Z(s) = \left(R_1, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \infty, \infty, \infty\right)$	12
10.9 INVALID-ORDER-9	$Z(s) = (L_1 s, \infty, R_3, \infty, \infty, \infty)$	12
10.10INVALID-ORDER-10	$Z(s) = \left(L_1 s, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	12
10.11INVALID-ORDER-11	$Z(s) = \left(L_1 s, \infty, R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	12
10.12INVALID-ORDER-12	$Z(s) = \left(L_1 s, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	12
10.13INVALID-ORDER-13	$Z(s) = \left(L_1 s, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1}, \infty, \infty, \infty\right)$	12
10.14INVALID-ORDER-14	$Z(s) = \left(L_1 s, \infty, L_3 s + R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	13
10.15INVALID-ORDER-15	$Z(s) = \left(L_1 s, \infty, \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \infty, \infty, \infty\right)$	13
10.16INVALID-ORDER-16	$Z(s) = \left(L_1 s, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \infty, \infty, \infty\right)$	13
10.17INVALID-ORDER-17	$Z(s) = \left(L_1 s, \infty, \frac{R_3 (C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \infty, \infty, \infty\right)$	13
10.18INVALID-ORDER-18	$Z(s) = \left(\frac{1}{C_1 s}, \infty, R_3, \infty, \infty, \infty\right)$	13
10.19INVALID-ORDER-19	$Z(s) = \left(\frac{1}{C_1 s}, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	13
10.20INVALID-ORDER-20	$Z(s) = \left(\frac{1}{C_1 s}, \infty, R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	13
10.21INVALID-ORDER-21	$Z(s) = \left(\frac{1}{C_1 s}, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	13
10.22INVALID-ORDER-22	$Z(s) = \left(\frac{1}{C_1 s}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1}, \infty, \infty, \infty\right)$	13
10.23INVALID-ORDER-23	$Z(s) = \left(\frac{1}{C_1 s}, \infty, L_3 s + R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	13
10.24INVALID-ORDER-24	$Z(s) = \left(\frac{1}{C_1 s}, \infty, \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \infty, \infty, \infty\right)$	14
10.25INVALID-ORDER-25	$Z(s) = \left(\frac{1}{C_1 s}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \infty, \infty, \infty\right)$	14
10.26INVALID-ORDER-26	$Z(s) = \left(\frac{1}{C_1 s}, \infty, \frac{R_3 (C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \infty, \infty, \infty\right)$	14
10.27INVALID-ORDER-27	$Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, R_3, \infty, \infty, \infty\right)$	14
10.28INVALID-ORDER-28	$Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	14
10.29INVALID-ORDER-29	$Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	14
10.30INVALID-ORDER-30	$Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	14
10.31INVALID-ORDER-31	$Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1}, \infty, \infty, \infty\right)$	14
10.32INVALID-ORDER-32	$Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, L_3 s + R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	14
10.33INVALID-ORDER-33	$Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \infty, \infty, \infty\right)$	14
10.34INVALID-ORDER-34	$Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \infty, \infty, \infty\right)$	15
10.35INVALID-ORDER-35	$Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \frac{R_3 (C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \infty, \infty, \infty\right)$	15
10.36INVALID-ORDER-36	$Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, R_3, \infty, \infty, \infty\right)$	15
10.37INVALID-ORDER-37	$Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	15
10.38INVALID-ORDER-38	$Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	15
10.39INVALID-ORDER-39	$Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty\right)$	15
10.40INVALID-ORDER-40	$Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1}, \infty, \infty, \infty\right)$	15

10.80INVALID-ORDER-80	$Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \infty, \infty, \infty \right)$	19
10.81INVALID-ORDER-81	$Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \frac{R_3(C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \infty, \infty, \infty \right)$	20
10.82INVALID-ORDER-82	$Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	20
10.83INVALID-ORDER-83	$Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, \frac{R_3}{C_3 R_3 s + 1}, \infty, \infty, \infty \right)$	20
10.84INVALID-ORDER-84	$Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	20
10.85INVALID-ORDER-85	$Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	20
10.86INVALID-ORDER-86	$Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1}, \infty, \infty, \infty \right)$	20
10.87INVALID-ORDER-87	$Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, L_3 s + R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$	20
10.88INVALID-ORDER-88	$Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \infty, \infty, \infty \right)$	20
10.89INVALID-ORDER-89	$Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \infty, \infty, \infty \right)$	20
10.90INVALID-ORDER-90	$Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, \frac{R_3(C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \infty, \infty, \infty \right)$	21

11 PolynomialError	21
---------------------------	-----------

1 Examined $H(z)$ for TIA simple Z1 Z3: $\frac{Z_1 Z_3 g_m}{Z_1 g_m + 1}$

$$H(z) = \frac{Z_1 Z_3 g_m}{Z_1 g_m + 1}$$

2 HP

3 BP

3.1 BP-1 $Z(s) = \left(R_1, \infty, \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \infty, \infty, \infty \right)$

$$H(s) = \frac{L_3 R_1 R_3 g_m s}{R_1 R_3 g_m + R_3 + s^2 (C_3 L_3 R_1 R_3 g_m + C_3 L_3 R_3) + s (L_3 R_1 g_m + L_3)}$$

Parameters:

Q: $C_3 R_3 \sqrt{\frac{1}{C_3 L_3}}$
 wo: $\sqrt{\frac{1}{C_3 L_3}}$
 bandwidth: $\frac{1}{C_3 R_3}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{R_1 R_3 g_m}{R_1 g_m + 1}$
 Qz: 0
 Wz: None

3.2 BP-2 $Z(s) = \left(L_1 s, \infty, \frac{R_3}{C_3 R_3 s + 1}, \infty, \infty, \infty \right)$

$$H(s) = \frac{L_1 R_3 g_m s}{C_3 L_1 R_3 g_m s^2 + s (C_3 R_3 + L_1 g_m) + 1}$$

Parameters:

Q: $\frac{C_3 L_1 R_3 g_m \sqrt{\frac{1}{C_3 L_1 R_3 g_m}}}{C_3 R_3 + L_1 g_m}$
 wo: $\sqrt{\frac{1}{C_3 L_1 R_3 g_m}}$
 bandwidth: $\frac{C_3 R_3 + L_1 g_m}{C_3 L_1 R_3 g_m}$
 K-LP: 0
 K-HP: 0
 K-BP: $\frac{L_1 R_3 g_m}{C_3 R_3 + L_1 g_m}$
 Qz: 0
 Wz: None

3.3 BP-3 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, R_3, \infty, \infty, \infty \right)$

$$H(s) = \frac{L_1 R_3 g_m s}{C_1 L_1 s^2 + L_1 g_m s + 1}$$

Parameters:

Q: $\frac{C_1 \sqrt{\frac{1}{C_1 L_1}}}{g_m}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{g_m}{C_1}$
 K-LP: 0
 K-HP: 0
 K-BP: R_3
 Qz: 0

Wz: None

$$\mathbf{3.4 \quad BP-4} \quad Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \quad \infty, \quad R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

Parameters:

$$\begin{aligned} \text{Q: } & \frac{C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}}{R_1 g_m + 1} \\ \text{wo: } & \sqrt{\frac{1}{C_1 L_1}} \\ \text{bandwidth: } & \frac{R_1 g_m + 1}{C_1 R_1} \\ \text{K-LP: } & 0 \\ \text{K-HP: } & 0 \\ \text{K-BP: } & \frac{R_1 R_3 g_m}{R_1 g_m + 1} \\ \text{Qz: } & 0 \\ \text{Wz: } & \text{None} \end{aligned}$$

$$H(s) = \frac{L_1 R_1 R_3 g_m s}{C_1 L_1 R_1 s^2 + R_1 + s(L_1 R_1 g_m + L_1)}$$

4 LP

$$\mathbf{4.1 \quad LP-1} \quad Z(s) = \left(\frac{1}{C_1 s}, \quad \infty, \quad \frac{R_3}{C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

Parameters:

$$\begin{aligned} \text{Q: } & \frac{C_1 C_3 R_3 \sqrt{\frac{g_m}{C_1 C_3 R_3}}}{C_1 + C_3 R_3 g_m} \\ \text{wo: } & \sqrt{\frac{g_m}{C_1 C_3 R_3}} \\ \text{bandwidth: } & \frac{C_1 + C_3 R_3 g_m}{C_1 C_3 R_3} \\ \text{K-LP: } & R_3 \\ \text{K-HP: } & 0 \\ \text{K-BP: } & 0 \\ \text{Qz: } & \text{None} \\ \text{Wz: } & \text{None} \end{aligned}$$

$$H(s) = \frac{R_3 g_m}{C_1 C_3 R_3 s^2 + g_m + s(C_1 + C_3 R_3 g_m)}$$

$$\mathbf{4.2 \quad LP-2} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad \frac{R_3}{C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

Parameters:

$$\begin{aligned} \text{Q: } & \frac{C_1 C_3 R_1 R_3 \sqrt{\frac{R_1 g_m + 1}{C_1 C_3 R_1 R_3}}}{C_1 R_1 + C_3 R_1 R_3 g_m + C_3 R_3} \\ \text{wo: } & \sqrt{\frac{R_1 g_m + 1}{C_1 C_3 R_1 R_3}} \\ \text{bandwidth: } & \frac{C_1 R_1 + C_3 R_1 R_3 g_m + C_3 R_3}{C_1 C_3 R_1 R_3} \\ \text{K-LP: } & \frac{R_1 R_3 g_m}{R_1 g_m + 1} \\ \text{K-HP: } & 0 \\ \text{K-BP: } & 0 \\ \text{Qz: } & \text{None} \\ \text{Wz: } & \text{None} \end{aligned}$$

$$H(s) = \frac{R_1 R_3 g_m}{C_1 C_3 R_1 R_3 s^2 + R_1 g_m + s(C_1 R_1 + C_3 R_1 R_3 g_m + C_3 R_3) + 1}$$

4.3 LP-3 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

Parameters:

Q: $\frac{C_1 \sqrt{\frac{1}{C_1 L_1}}}{g_m}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{g_m}{C_1}$
 K-LP: $\frac{L_1 g_m}{C_3}$
 K-HP: 0
 K-BP: 0
 Qz: None
 Wz: None

$$H(s) = \frac{L_1 g_m}{C_1 C_3 L_1 s^2 + C_3 L_1 g_m s + C_3}$$

4.4 LP-4 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

Parameters:

Q: $\frac{C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}}{R_1 g_m + 1}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{R_1 g_m + 1}{C_1 R_1}$
 K-LP: $\frac{L_1 g_m}{C_3}$
 K-HP: 0
 K-BP: 0
 Qz: None
 Wz: None

$$H(s) = \frac{L_1 R_1 g_m}{C_1 C_3 L_1 R_1 s^2 + C_3 R_1 + s (C_3 L_1 R_1 g_m + C_3 L_1)}$$

5 BS

5.1 BS-1 $Z(s) = \left(R_1, \infty, \frac{R_3 (C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \infty, \infty, \infty \right)$

Parameters:

Q: $\frac{L_3 \sqrt{\frac{1}{C_3 L_3}}}{R_3}$
 wo: $\sqrt{\frac{1}{C_3 L_3}}$
 bandwidth: $\frac{R_3}{L_3}$
 K-LP: $\frac{R_1 R_3 g_m}{R_1 g_m + 1}$
 K-HP: $\frac{R_1 R_3 g_m}{R_1 g_m + 1}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_3 L_3}}$

$$H(s) = \frac{C_3 L_3 R_1 R_3 g_m s^2 + R_1 R_3 g_m}{R_1 g_m + s^2 (C_3 L_3 R_1 g_m + C_3 L_3) + s (C_3 R_1 R_3 g_m + C_3 R_3) + 1}$$

5.2 BS-2 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, R_3, \infty, \infty, \infty \right)$

Parameters:

Q: $L_1 g_m \sqrt{\frac{1}{C_1 L_1}}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{1}{L_1 g_m}$
 K-LP: R_3
 K-HP: R_3
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_1 L_1}}$

5.3 BS-3 $Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \infty, R_3, \infty, \infty, \infty \right)$

Parameters:

Q: $\frac{L_1 \sqrt{\frac{1}{C_1 L_1}} (R_1 g_m + 1)}{R_1}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{R_1}{L_1 (R_1 g_m + 1)}$
 K-LP: $\frac{R_1 R_3 g_m}{R_1 g_m + 1}$
 K-HP: $\frac{R_1 R_3 g_m}{R_1 g_m + 1}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_1 L_1}}$

6 GE

6.1 GE-1 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, R_3, \infty, \infty, \infty \right)$

Parameters:

Q: $\frac{L_1 g_m \sqrt{\frac{1}{C_1 L_1}}}{R_1 g_m + 1}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{R_1 g_m + 1}{L_1 g_m}$
 K-LP: R_3
 K-HP: R_3
 K-BP: $\frac{R_1 R_3 g_m}{R_1 g_m + 1}$
 Qz: $\frac{L_1 \sqrt{\frac{1}{C_1 L_1}}}{R_1}$
 Wz: $\sqrt{\frac{1}{C_1 L_1}}$

$$H(s) = \frac{C_1 L_1 R_3 g_m s^2 + R_3 g_m}{C_1 L_1 g_m s^2 + C_1 s + g_m}$$

$$H(s) = \frac{C_1 L_1 R_1 R_3 g_m s^2 + R_1 R_3 g_m}{C_1 R_1 s + R_1 g_m + s^2 (C_1 L_1 R_1 g_m + C_1 L_1) + 1}$$

$$H(s) = \frac{C_1 L_1 R_3 g_m s^2 + C_1 R_1 R_3 g_m s + R_3 g_m}{C_1 L_1 g_m s^2 + g_m + s (C_1 R_1 g_m + C_1)}$$

6.2 GE-2 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, R_3, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 L_1 R_1 R_3 g_m s^2 + L_1 R_3 g_m s + R_1 R_3 g_m}{L_1 g_m s + R_1 g_m + s^2 (C_1 L_1 R_1 g_m + C_1 L_1) + 1}$$

Parameters:

Q: $\frac{C_1 \sqrt{\frac{1}{C_1 L_1}} (R_1 g_m + 1)}{g_m}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{g_m}{C_1 (R_1 g_m + 1)}$
 K-LP: $\frac{R_1 R_3 g_m}{R_1 g_m + 1}$
 K-HP: $\frac{R_1 R_3 g_m}{R_1 g_m + 1}$
 K-BP: R_3
 Qz: $C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}$
 Wz: $\sqrt{\frac{1}{C_1 L_1}}$

7 AP

8 INVALID-NUMER

8.1 INVALID-NUMER-1 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \frac{R_3}{C_3 R_3 s + 1}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 R_1 R_3 g_m s + R_3 g_m}{g_m + s^2 (C_1 C_3 R_1 R_3 g_m + C_1 C_3 R_3) + s (C_1 R_1 g_m + C_1 + C_3 R_3 g_m)}$$

Parameters:

Q: $\frac{C_1 C_3 R_3 \sqrt{\frac{g_m}{C_1 C_3 R_3 (R_1 g_m + 1)}} (R_1 g_m + 1)}{C_1 R_1 g_m + C_1 + C_3 R_3 g_m}$
 wo: $\sqrt{\frac{g_m}{C_1 C_3 R_3 (R_1 g_m + 1)}}$
 bandwidth: $\frac{C_1 R_1 g_m + C_1 + C_3 R_3 g_m}{C_1 C_3 R_3 (R_1 g_m + 1)}$
 K-LP: R_3
 K-HP: 0
 K-BP: $\frac{C_1 R_1 R_3 g_m}{C_1 R_1 g_m + C_1 + C_3 R_3 g_m}$
 Qz: 0
 Wz: None

8.2 INVALID-NUMER-2 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_3 L_1 R_3 g_m s + L_1 g_m}{C_1 C_3 L_1 s^2 + C_3 L_1 g_m s + C_3}$$

Parameters:

Q: $\frac{C_1 \sqrt{\frac{1}{C_1 L_1}}}{g_m}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{g_m}{C_1}$
 K-LP: $\frac{L_1 g_m}{C_3}$
 K-HP: 0
 K-BP: R_3
 Qz: 0
 Wz: None

8.3 INVALID-NUMER-3 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_3 L_1 R_1 R_3 g_m s + L_1 R_1 g_m}{C_1 C_3 L_1 R_1 s^2 + C_3 R_1 + s (C_3 L_1 R_1 g_m + C_3 L_1)}$$

Parameters:

Q: $\frac{C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}}{R_1 g_m + 1}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{R_1 g_m + 1}{C_1 R_1}$
 K-LP: $\frac{L_1 g_m}{C_3}$
 K-HP: 0
 K-BP: $\frac{R_1 R_3 g_m}{R_1 g_m + 1}$
 Qz: 0
 Wz: None

9 INVALID-WZ

9.1 INVALID-WZ-1 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_3 L_1 L_3 g_m s^2 + L_1 g_m}{C_1 C_3 L_1 s^2 + C_3 L_1 g_m s + C_3}$$

Parameters:

Q: $\frac{C_1 \sqrt{\frac{1}{C_1 L_1}}}{g_m}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{g_m}{C_1}$
 K-LP: $\frac{L_1 g_m}{C_3}$
 K-HP: $\frac{L_3 g_m}{C_1}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_3 L_3}}$

9.2 INVALID-WZ-2 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, L_3 s + R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_3 L_1 L_3 g_m s^2 + C_3 L_1 R_3 g_m s + L_1 g_m}{C_1 C_3 L_1 s^2 + C_3 L_1 g_m s + C_3}$$

Parameters:

Q: $\frac{C_1 \sqrt{\frac{1}{C_1 L_1}}}{g_m}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{g_m}{C_1}$
 K-LP: $\frac{L_1 g_m}{C_3}$
 K-HP: $\frac{L_3 g_m}{C_1}$
 K-BP: R_3
 Qz: $\frac{L_3 \sqrt{\frac{1}{C_1 L_1}}}{R_3}$
 Wz: $\sqrt{\frac{1}{C_3 L_3}}$

9.3 INVALID-WZ-3 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_3 L_1 L_3 R_1 g_m s^2 + L_1 R_1 g_m}{C_1 C_3 L_1 R_1 s^2 + C_3 R_1 + s (C_3 L_1 R_1 g_m + C_3 L_1)}$$

Parameters:

Q: $\frac{C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}}{R_1 g_m + 1}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{R_1 g_m + 1}{C_1 R_1}$
 K-LP: $\frac{L_1 g_m}{C_3}$
 K-HP: $\frac{L_3 g_m}{C_1}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_3 L_3}}$

9.4 INVALID-WZ-4 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, L_3 s + R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_3 L_1 L_3 R_1 g_m s^2 + C_3 L_1 R_1 R_3 g_m s + L_1 R_1 g_m}{C_1 C_3 L_1 R_1 s^2 + C_3 R_1 + s (C_3 L_1 R_1 g_m + C_3 L_1)}$$

Parameters:

Q: $\frac{C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}}{R_1 g_m + 1}$
 wo: $\sqrt{\frac{1}{C_1 L_1}}$
 bandwidth: $\frac{R_1 g_m + 1}{C_1 R_1}$
 K-LP: $\frac{L_1 g_m}{C_3}$
 K-HP: $\frac{L_3 g_m}{C_1}$
 K-BP: $\frac{R_1 R_3 g_m}{R_1 g_m + 1}$
 Qz: $\frac{L_3 \sqrt{\frac{1}{C_1 L_1}}}{R_3}$
 Wz: $\sqrt{\frac{1}{C_3 L_3}}$

10 INVALID-ORDER

10.1 INVALID-ORDER-1 $Z(s) = (R_1, \infty, R_3, \infty, \infty, \infty)$

$$H(s) = \frac{R_1 R_3 g_m}{R_1 g_m + 1}$$

10.2 INVALID-ORDER-2 $Z(s) = \left(R_1, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{R_1 g_m}{s (C_3 R_1 g_m + C_3)}$$

10.3 INVALID-ORDER-3 $Z(s) = \left(R_1, \infty, \frac{R_3}{C_3 R_3 s + 1}, \infty, \infty, \infty \right)$

$$H(s) = \frac{R_1 R_3 g_m}{R_1 g_m + s (C_3 R_1 R_3 g_m + C_3 R_3) + 1}$$

$$10.4 \quad \text{INVALID-ORDER-4} \quad Z(s) = \left(R_1, \quad \infty, \quad R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 R_1 R_3 g_m s + R_1 g_m}{s (C_3 R_1 g_m + C_3)}$$

$$10.5 \quad \text{INVALID-ORDER-5} \quad Z(s) = \left(R_1, \quad \infty, \quad L_3 s + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_3 R_1 g_m s^2 + R_1 g_m}{s (C_3 R_1 g_m + C_3)}$$

$$10.6 \quad \text{INVALID-ORDER-6} \quad Z(s) = \left(R_1, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_3 R_1 g_m s}{R_1 g_m + s^2 (C_3 L_3 R_1 g_m + C_3 L_3) + 1}$$

$$10.7 \quad \text{INVALID-ORDER-7} \quad Z(s) = \left(R_1, \quad \infty, \quad L_3 s + R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_3 R_1 g_m s^2 + C_3 R_1 R_3 g_m s + R_1 g_m}{s (C_3 R_1 g_m + C_3)}$$

$$10.8 \quad \text{INVALID-ORDER-8} \quad Z(s) = \left(R_1, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_3 R_1 R_3 g_m s^2 + L_3 R_1 g_m s + R_1 R_3 g_m}{R_1 g_m + s^2 (C_3 L_3 R_1 g_m + C_3 L_3) + 1}$$

$$10.9 \quad \text{INVALID-ORDER-9} \quad Z(s) = (L_1 s, \quad \infty, \quad R_3, \quad \infty, \quad \infty, \quad \infty)$$

$$H(s) = \frac{L_1 R_3 g_m s}{L_1 g_m s + 1}$$

$$10.10 \quad \text{INVALID-ORDER-10} \quad Z(s) = \left(L_1 s, \quad \infty, \quad \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 g_m}{C_3 L_1 g_m s + C_3}$$

$$10.11 \quad \text{INVALID-ORDER-11} \quad Z(s) = \left(L_1 s, \quad \infty, \quad R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_1 R_3 g_m s + L_1 g_m}{C_3 L_1 g_m s + C_3}$$

$$10.12 \quad \text{INVALID-ORDER-12} \quad Z(s) = \left(L_1 s, \quad \infty, \quad L_3 s + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_1 L_3 g_m s^2 + L_1 g_m}{C_3 L_1 g_m s + C_3}$$

$$10.13 \quad \text{INVALID-ORDER-13} \quad Z(s) = \left(L_1 s, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 L_3 g_m s^2}{C_3 L_1 L_3 g_m s^3 + C_3 L_3 s^2 + L_1 g_m s + 1}$$

$$10.14 \quad \text{INVALID-ORDER-14} \quad Z(s) = \left(L_1 s, \quad \infty, \quad L_3 s + R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_1 L_3 g_m s^2 + C_3 L_1 R_3 g_m s + L_1 g_m}{C_3 L_1 g_m s + C_3}$$

$$10.15 \quad \text{INVALID-ORDER-15} \quad Z(s) = \left(L_1 s, \quad \infty, \quad \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 L_3 R_3 g_m s^2}{C_3 L_1 L_3 R_3 g_m s^3 + R_3 + s^2 (C_3 L_3 R_3 + L_1 L_3 g_m) + s (L_1 R_3 g_m + L_3)}$$

$$10.16 \quad \text{INVALID-ORDER-16} \quad Z(s) = \left(L_1 s, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_1 L_3 R_3 g_m s^3 + L_1 L_3 g_m s^2 + L_1 R_3 g_m s}{C_3 L_1 L_3 g_m s^3 + C_3 L_3 s^2 + L_1 g_m s + 1}$$

$$10.17 \quad \text{INVALID-ORDER-17} \quad Z(s) = \left(L_1 s, \quad \infty, \quad \frac{R_3 (C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_1 L_3 R_3 g_m s^3 + L_1 R_3 g_m s}{C_3 L_1 L_3 g_m s^3 + s^2 (C_3 L_1 R_3 g_m + C_3 L_3) + s (C_3 R_3 + L_1 g_m) + 1}$$

$$10.18 \quad \text{INVALID-ORDER-18} \quad Z(s) = \left(\frac{1}{C_1 s}, \quad \infty, \quad R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_3 g_m}{C_1 s + g_m}$$

$$10.19 \quad \text{INVALID-ORDER-19} \quad Z(s) = \left(\frac{1}{C_1 s}, \quad \infty, \quad \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{g_m}{C_1 C_3 s^2 + C_3 g_m s}$$

$$10.20 \quad \text{INVALID-ORDER-20} \quad Z(s) = \left(\frac{1}{C_1 s}, \quad \infty, \quad R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 R_3 g_m s + g_m}{C_1 C_3 s^2 + C_3 g_m s}$$

$$10.21 \quad \text{INVALID-ORDER-21} \quad Z(s) = \left(\frac{1}{C_1 s}, \quad \infty, \quad L_3 s + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_3 g_m s^2 + g_m}{C_1 C_3 s^2 + C_3 g_m s}$$

$$10.22 \quad \text{INVALID-ORDER-22} \quad Z(s) = \left(\frac{1}{C_1 s}, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_3 g_m s}{C_1 C_3 L_3 s^3 + C_1 s + C_3 L_3 g_m s^2 + g_m}$$

$$10.23 \quad \text{INVALID-ORDER-23} \quad Z(s) = \left(\frac{1}{C_1 s}, \quad \infty, \quad L_3 s + R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_3 g_m s^2 + C_3 R_3 g_m s + g_m}{C_1 C_3 s^2 + C_3 g_m s}$$

$$10.24 \quad \text{INVALID-ORDER-24} \quad Z(s) = \left(\frac{1}{C_1 s}, \quad \infty, \quad \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_3 R_3 g_m s}{C_1 C_3 L_3 R_3 s^3 + R_3 g_m + s^2 (C_1 L_3 + C_3 L_3 R_3 g_m) + s (C_1 R_3 + L_3 g_m)}$$

$$10.25 \quad \text{INVALID-ORDER-25} \quad Z(s) = \left(\frac{1}{C_1 s}, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_3 R_3 g_m s^2 + L_3 g_m s + R_3 g_m}{C_1 C_3 L_3 s^3 + C_1 s + C_3 L_3 g_m s^2 + g_m}$$

$$10.26 \quad \text{INVALID-ORDER-26} \quad Z(s) = \left(\frac{1}{C_1 s}, \quad \infty, \quad \frac{R_3 (C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_3 R_3 g_m s^2 + R_3 g_m}{C_1 C_3 L_3 s^3 + g_m + s^2 (C_1 C_3 R_3 + C_3 L_3 g_m) + s (C_1 + C_3 R_3 g_m)}$$

$$10.27 \quad \text{INVALID-ORDER-27} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_1 R_3 g_m}{C_1 R_1 s + R_1 g_m + 1}$$

$$10.28 \quad \text{INVALID-ORDER-28} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_1 g_m}{C_1 C_3 R_1 s^2 + s (C_3 R_1 g_m + C_3)}$$

$$10.29 \quad \text{INVALID-ORDER-29} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 R_1 R_3 g_m s + R_1 g_m}{C_1 C_3 R_1 s^2 + s (C_3 R_1 g_m + C_3)}$$

$$10.30 \quad \text{INVALID-ORDER-30} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad L_3 s + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_3 R_1 g_m s^2 + R_1 g_m}{C_1 C_3 R_1 s^2 + s (C_3 R_1 g_m + C_3)}$$

$$10.31 \quad \text{INVALID-ORDER-31} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_3 R_1 g_m s}{C_1 C_3 L_3 R_1 s^3 + C_1 R_1 s + R_1 g_m + s^2 (C_3 L_3 R_1 g_m + C_3 L_3) + 1}$$

$$10.32 \quad \text{INVALID-ORDER-32} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad L_3 s + R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_3 R_1 g_m s^2 + C_3 R_1 R_3 g_m s + R_1 g_m}{C_1 C_3 R_1 s^2 + s (C_3 R_1 g_m + C_3)}$$

$$10.33 \quad \text{INVALID-ORDER-33} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_3 R_1 R_3 g_m s}{C_1 C_3 L_3 R_1 R_3 s^3 + R_1 R_3 g_m + R_3 + s^2 (C_1 L_3 R_1 + C_3 L_3 R_1 R_3 g_m + C_3 L_3 R_3) + s (C_1 R_1 R_3 + L_3 R_1 g_m + L_3)}$$

$$10.34 \quad \text{INVALID-ORDER-34} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_3 R_1 R_3 g_m s^2 + L_3 R_1 g_m s + R_1 R_3 g_m}{C_1 C_3 L_3 R_1 s^3 + C_1 R_1 s + R_1 g_m + s^2 (C_3 L_3 R_1 g_m + C_3 L_3) + 1}$$

$$10.35 \quad \text{INVALID-ORDER-35} \quad Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \quad \infty, \quad \frac{R_3 (C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_3 R_1 R_3 g_m s^2 + R_1 R_3 g_m}{C_1 C_3 L_3 R_1 s^3 + R_1 g_m + s^2 (C_1 C_3 R_1 R_3 + C_3 L_3 R_1 g_m + C_3 L_3) + s (C_1 R_1 + C_3 R_1 R_3 g_m + C_3 R_3) + 1}$$

$$10.36 \quad \text{INVALID-ORDER-36} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 R_1 R_3 g_m s + R_3 g_m}{g_m + s (C_1 R_1 g_m + C_1)}$$

$$10.37 \quad \text{INVALID-ORDER-37} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 R_1 g_m s + g_m}{C_3 g_m s + s^2 (C_1 C_3 R_1 g_m + C_1 C_3)}$$

$$10.38 \quad \text{INVALID-ORDER-38} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 R_1 R_3 g_m s^2 + g_m + s (C_1 R_1 g_m + C_3 R_3 g_m)}{C_3 g_m s + s^2 (C_1 C_3 R_1 g_m + C_1 C_3)}$$

$$10.39 \quad \text{INVALID-ORDER-39} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad L_3 s + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_3 R_1 g_m s^3 + C_1 R_1 g_m s + C_3 L_3 g_m s^2 + g_m}{C_3 g_m s + s^2 (C_1 C_3 R_1 g_m + C_1 C_3)}$$

$$10.40 \quad \text{INVALID-ORDER-40} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_3 R_1 g_m s^2 + L_3 g_m s}{C_3 L_3 g_m s^2 + g_m + s^3 (C_1 C_3 L_3 R_1 g_m + C_1 C_3 L_3) + s (C_1 R_1 g_m + C_1)}$$

$$10.41 \quad \text{INVALID-ORDER-41} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad L_3 s + R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_3 R_1 g_m s^3 + g_m + s^2 (C_1 C_3 R_1 R_3 g_m + C_3 L_3 g_m) + s (C_1 R_1 g_m + C_3 R_3 g_m)}{C_3 g_m s + s^2 (C_1 C_3 R_1 g_m + C_1 C_3)}$$

$$10.42 \quad \text{INVALID-ORDER-42} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_3 R_1 R_3 g_m s^2 + L_3 R_3 g_m s}{R_3 g_m + s^3 (C_1 C_3 L_3 R_1 R_3 g_m + C_1 C_3 L_3 R_3) + s^2 (C_1 L_3 R_1 g_m + C_1 L_3 + C_3 L_3 R_3 g_m) + s (C_1 R_1 R_3 g_m + C_1 R_3 + L_3 g_m)}$$

$$10.43 \quad \text{INVALID-ORDER-43} \quad Z(s) = \left(R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_3 R_1 R_3 g_m s^3 + R_3 g_m + s^2 (C_1 L_3 R_1 g_m + C_3 L_3 R_3 g_m) + s (C_1 R_1 R_3 g_m + L_3 g_m)}{C_3 L_3 g_m s^2 + g_m + s^3 (C_1 C_3 L_3 R_1 g_m + C_1 C_3 L_3) + s (C_1 R_1 g_m + C_1)}$$

10.44 INVALID-ORDER-44 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \frac{R_3(C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 C_3 L_3 R_1 R_3 g_m s^3 + C_1 R_1 R_3 g_m s + C_3 L_3 R_3 g_m s^2 + R_3 g_m}{g_m + s^3 (C_1 C_3 L_3 R_1 g_m + C_1 C_3 L_3) + s^2 (C_1 C_3 R_1 R_3 g_m + C_1 C_3 R_3 + C_3 L_3 g_m) + s (C_1 R_1 g_m + C_1 + C_3 R_3 g_m)}$$

10.45 INVALID-ORDER-45 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 L_1 g_m s^2 + g_m}{C_1 C_3 L_1 g_m s^3 + C_1 C_3 s^2 + C_3 g_m s}$$

10.46 INVALID-ORDER-46 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, \frac{R_3}{C_3 R_3 s + 1}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 L_1 R_3 g_m s^2 + R_3 g_m}{C_1 C_3 L_1 R_3 g_m s^3 + g_m + s^2 (C_1 C_3 R_3 + C_1 L_1 g_m) + s (C_1 + C_3 R_3 g_m)}$$

10.47 INVALID-ORDER-47 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 C_3 L_1 R_3 g_m s^3 + C_1 L_1 g_m s^2 + C_3 R_3 g_m s + g_m}{C_1 C_3 L_1 g_m s^3 + C_1 C_3 s^2 + C_3 g_m s}$$

10.48 INVALID-ORDER-48 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 C_3 L_1 L_3 g_m s^4 + g_m + s^2 (C_1 L_1 g_m + C_3 L_3 g_m)}{C_1 C_3 L_1 g_m s^3 + C_1 C_3 s^2 + C_3 g_m s}$$

10.49 INVALID-ORDER-49 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 L_1 L_3 g_m s^3 + L_3 g_m s}{C_1 C_3 L_1 L_3 g_m s^4 + C_1 C_3 L_3 s^3 + C_1 s + g_m + s^2 (C_1 L_1 g_m + C_3 L_3 g_m)}$$

10.50 INVALID-ORDER-50 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, L_3 s + R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 C_3 L_1 L_3 g_m s^4 + C_1 C_3 L_1 R_3 g_m s^3 + C_3 R_3 g_m s + g_m + s^2 (C_1 L_1 g_m + C_3 L_3 g_m)}{C_1 C_3 L_1 g_m s^3 + C_1 C_3 s^2 + C_3 g_m s}$$

10.51 INVALID-ORDER-51 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 L_1 L_3 R_3 g_m s^3 + L_3 R_3 g_m s}{C_1 C_3 L_1 L_3 R_3 g_m s^4 + R_3 g_m + s^3 (C_1 C_3 L_3 R_3 + C_1 L_1 L_3 g_m) + s^2 (C_1 L_1 R_3 g_m + C_1 L_3 + C_3 L_3 R_3 g_m) + s (C_1 R_3 + L_3 g_m)}$$

10.52 INVALID-ORDER-52 $Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 C_3 L_1 L_3 R_3 g_m s^4 + C_1 L_1 L_3 g_m s^3 + L_3 g_m s + R_3 g_m + s^2 (C_1 L_1 R_3 g_m + C_3 L_3 R_3 g_m)}{C_1 C_3 L_1 L_3 g_m s^4 + C_1 C_3 L_3 s^3 + C_1 s + g_m + s^2 (C_1 L_1 g_m + C_3 L_3 g_m)}$$

$$10.53 \quad \text{INVALID-ORDER-53} \quad Z(s) = \left(L_1 s + \frac{1}{C_1 s}, \quad \infty, \quad \frac{R_3(C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_1 L_3 R_3 g_m s^4 + R_3 g_m + s^2 (C_1 L_1 R_3 g_m + C_3 L_3 R_3 g_m)}{C_1 C_3 L_1 L_3 g_m s^4 + g_m + s^3 (C_1 C_3 L_1 R_3 g_m + C_1 C_3 L_3) + s^2 (C_1 C_3 R_3 + C_1 L_1 g_m + C_3 L_3 g_m) + s (C_1 + C_3 R_3 g_m)}$$

$$10.54 \quad \text{INVALID-ORDER-54} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \quad \infty, \quad \frac{R_3}{C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 R_3 g_m s}{C_1 C_3 L_1 R_3 s^3 + s^2 (C_1 L_1 + C_3 L_1 R_3 g_m) + s (C_3 R_3 + L_1 g_m) + 1}$$

$$10.55 \quad \text{INVALID-ORDER-55} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 L_3 g_m s^2}{C_1 C_3 L_1 L_3 s^4 + C_3 L_1 L_3 g_m s^3 + L_1 g_m s + s^2 (C_1 L_1 + C_3 L_3) + 1}$$

$$10.56 \quad \text{INVALID-ORDER-56} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \quad \infty, \quad \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 L_3 R_3 g_m s^2}{C_1 C_3 L_1 L_3 R_3 s^4 + R_3 + s^3 (C_1 L_1 L_3 + C_3 L_1 L_3 R_3 g_m) + s^2 (C_1 L_1 R_3 + C_3 L_3 R_3 + L_1 L_3 g_m) + s (L_1 R_3 g_m + L_3)}$$

$$10.57 \quad \text{INVALID-ORDER-57} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_1 L_3 R_3 g_m s^3 + L_1 L_3 g_m s^2 + L_1 R_3 g_m s}{C_1 C_3 L_1 L_3 s^4 + C_3 L_1 L_3 g_m s^3 + L_1 g_m s + s^2 (C_1 L_1 + C_3 L_3) + 1}$$

$$10.58 \quad \text{INVALID-ORDER-58} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \quad \infty, \quad \frac{R_3(C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_1 L_3 R_3 g_m s^3 + L_1 R_3 g_m s}{C_1 C_3 L_1 L_3 s^4 + s^3 (C_1 C_3 L_1 R_3 + C_3 L_1 L_3 g_m) + s^2 (C_1 L_1 + C_3 L_1 R_3 g_m + C_3 L_3) + s (C_3 R_3 + L_1 g_m) + 1}$$

$$10.59 \quad \text{INVALID-ORDER-59} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_1 g_m s^2 + C_1 R_1 g_m s + g_m}{C_1 C_3 L_1 g_m s^3 + C_3 g_m s + s^2 (C_1 C_3 R_1 g_m + C_1 C_3)}$$

$$10.60 \quad \text{INVALID-ORDER-60} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \quad \infty, \quad \frac{R_3}{C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_1 R_3 g_m s^2 + C_1 R_1 R_3 g_m s + R_3 g_m}{C_1 C_3 L_1 R_3 g_m s^3 + g_m + s^2 (C_1 C_3 R_1 R_3 g_m + C_1 C_3 R_3 + C_1 L_1 g_m) + s (C_1 R_1 g_m + C_1 + C_3 R_3 g_m)}$$

$$10.61 \quad \text{INVALID-ORDER-61} \quad Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \quad \infty, \quad R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_1 R_3 g_m s^3 + g_m + s^2 (C_1 C_3 R_1 R_3 g_m + C_1 L_1 g_m) + s (C_1 R_1 g_m + C_3 R_3 g_m)}{C_1 C_3 L_1 g_m s^3 + C_3 g_m s + s^2 (C_1 C_3 R_1 g_m + C_1 C_3)}$$

10.62 INVALID-ORDER-62 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, L_3 s + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 C_3 L_1 L_3 g_m s^4 + C_1 C_3 L_3 R_1 g_m s^3 + C_1 R_1 g_m s + g_m + s^2 (C_1 L_1 g_m + C_3 L_3 g_m)}{C_1 C_3 L_1 g_m s^3 + C_3 g_m s + s^2 (C_1 C_3 R_1 g_m + C_1 C_3)}$$

10.63 INVALID-ORDER-63 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 L_1 L_3 g_m s^3 + C_1 L_3 R_1 g_m s^2 + L_3 g_m s}{C_1 C_3 L_1 L_3 g_m s^4 + g_m + s^3 (C_1 C_3 L_3 R_1 g_m + C_1 C_3 L_3) + s^2 (C_1 L_1 g_m + C_3 L_3 g_m) + s (C_1 R_1 g_m + C_1)}$$

10.64 INVALID-ORDER-64 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, L_3 s + R_3 + \frac{1}{C_3 s}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 C_3 L_1 L_3 g_m s^4 + g_m + s^3 (C_1 C_3 L_1 R_3 g_m + C_1 C_3 L_3 R_1 g_m) + s^2 (C_1 C_3 R_1 R_3 g_m + C_1 L_1 g_m + C_3 L_3 g_m) + s (C_1 R_1 g_m + C_3 R_3 g_m)}{C_1 C_3 L_1 g_m s^3 + C_3 g_m s + s^2 (C_1 C_3 R_1 g_m + C_1 C_3)}$$

10.65 INVALID-ORDER-65 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 L_1 L_3 R_3 g_m s^3 + C_1 L_3 R_1 R_3 g_m s^2 + L_3 R_3 g_m s}{C_1 C_3 L_1 L_3 R_3 g_m s^4 + R_3 g_m + s^3 (C_1 C_3 L_3 R_1 R_3 g_m + C_1 C_3 L_3 R_3 + C_1 L_1 L_3 g_m) + s^2 (C_1 L_1 R_3 g_m + C_1 L_3 R_1 g_m + C_1 L_3 + C_3 L_3 R_3 g_m) + s (C_1 R_1 R_3 g_m + C_1 R_3 + L_3 g_m)}$$

10.66 INVALID-ORDER-66 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 C_3 L_1 L_3 R_3 g_m s^4 + R_3 g_m + s^3 (C_1 C_3 L_3 R_1 R_3 g_m + C_1 L_1 L_3 g_m) + s^2 (C_1 L_1 R_3 g_m + C_1 L_3 R_1 g_m + C_3 L_3 R_3 g_m) + s (C_1 R_1 R_3 g_m + L_3 g_m)}{C_1 C_3 L_1 L_3 g_m s^4 + g_m + s^3 (C_1 C_3 L_3 R_1 g_m + C_1 C_3 L_3) + s^2 (C_1 L_1 g_m + C_3 L_3 g_m) + s (C_1 R_1 g_m + C_1)}$$

10.67 INVALID-ORDER-67 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \frac{R_3 (C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_1 C_3 L_1 L_3 R_3 g_m s^4 + C_1 C_3 L_3 R_1 R_3 g_m s^3 + C_1 R_1 R_3 g_m s + R_3 g_m + s^2 (C_1 L_1 R_3 g_m + C_3 L_3 R_3 g_m)}{C_1 C_3 L_1 L_3 g_m s^4 + g_m + s^3 (C_1 C_3 L_1 R_3 g_m + C_1 C_3 L_3 R_1 g_m + C_1 C_3 L_3) + s^2 (C_1 C_3 R_1 R_3 g_m + C_1 C_3 R_3 + C_1 L_1 g_m + C_3 L_3 g_m) + s (C_1 R_1 g_m + C_1 + C_3 R_3 g_m)}$$

10.68 INVALID-ORDER-68 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, \frac{R_3}{C_3 R_3 s + 1}, \infty, \infty, \infty \right)$

$$H(s) = \frac{L_1 R_1 R_3 g_m s}{C_1 C_3 L_1 R_1 R_3 s^3 + R_1 + s^2 (C_1 L_1 R_1 + C_3 L_1 R_1 R_3 g_m + C_3 L_1 R_3) + s (C_3 R_1 R_3 + L_1 R_1 g_m + L_1)}$$

10.69 INVALID-ORDER-69 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1}, \infty, \infty, \infty \right)$

$$H(s) = \frac{L_1 L_3 R_1 g_m s^2}{C_1 C_3 L_1 L_3 R_1 s^4 + R_1 + s^3 (C_3 L_1 L_3 R_1 g_m + C_3 L_1 L_3) + s^2 (C_1 L_1 R_1 + C_3 L_3 R_1) + s (L_1 R_1 g_m + L_1)}$$

10.70 INVALID-ORDER-70 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \infty, \infty, \infty \right)$

$$H(s) = \frac{L_1 L_3 R_1 R_3 g_m s^2}{C_1 C_3 L_1 L_3 R_1 R_3 s^4 + R_1 R_3 + s^3 (C_1 L_1 L_3 R_1 + C_3 L_1 L_3 R_1 R_3 g_m + C_3 L_1 L_3 R_3) + s^2 (C_1 L_1 R_1 R_3 + C_3 L_3 R_1 R_3 + L_1 L_3 R_1 g_m + L_1 L_3) + s (L_1 R_1 R_3 g_m + L_1 R_3 + L_3 R_1)}$$

10.71 INVALID-ORDER-71 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \infty, \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \infty, \infty, \infty \right)$

$$H(s) = \frac{C_3 L_1 L_3 R_1 R_3 g_m s^3 + L_1 L_3 R_1 g_m s^2 + L_1 R_1 R_3 g_m s}{C_1 C_3 L_1 L_3 R_1 s^4 + R_1 + s^3 (C_3 L_1 L_3 R_1 g_m + C_3 L_1 L_3) + s^2 (C_1 L_1 R_1 + C_3 L_3 R_1) + s (L_1 R_1 g_m + L_1)}$$

$$10.72 \quad \text{INVALID-ORDER-72} \quad Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \quad \infty, \quad \frac{R_3 (C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_3 L_1 L_3 R_1 R_3 g_m s^3 + L_1 R_1 R_3 g_m s}{C_1 C_3 L_1 L_3 R_1 s^4 + R_1 + s^3 (C_1 C_3 L_1 R_1 R_3 + C_3 L_1 L_3 R_1 g_m + C_3 L_1 L_3) + s^2 (C_1 L_1 R_1 + C_3 L_1 R_1 R_3 g_m + C_3 L_1 R_3 + C_3 L_3 R_1) + s (C_3 R_1 R_3 + L_1 R_1 g_m + L_1)}$$

$$10.73 \quad \text{INVALID-ORDER-73} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_1 R_1 g_m s^2 + L_1 g_m s + R_1 g_m}{C_3 L_1 g_m s^2 + s^3 (C_1 C_3 L_1 R_1 g_m + C_1 C_3 L_1) + s (C_3 R_1 g_m + C_3)}$$

$$10.74 \quad \text{INVALID-ORDER-74} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad \frac{R_3}{C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_1 R_1 R_3 g_m s^2 + L_1 R_3 g_m s + R_1 R_3 g_m}{R_1 g_m + s^3 (C_1 C_3 L_1 R_1 R_3 g_m + C_1 C_3 L_1 R_3) + s^2 (C_1 L_1 R_1 g_m + C_1 L_1 + C_3 L_1 R_3 g_m) + s (C_3 R_1 R_3 g_m + C_3 R_3 + L_1 g_m) + 1}$$

$$10.75 \quad \text{INVALID-ORDER-75} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_1 R_1 R_3 g_m s^3 + R_1 g_m + s^2 (C_1 L_1 R_1 g_m + C_3 L_1 R_3 g_m) + s (C_3 R_1 R_3 g_m + L_1 g_m)}{C_3 L_1 g_m s^2 + s^3 (C_1 C_3 L_1 R_1 g_m + C_1 C_3 L_1) + s (C_3 R_1 g_m + C_3)}$$

$$10.76 \quad \text{INVALID-ORDER-76} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad L_3 s + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_1 L_3 R_1 g_m s^4 + C_3 L_1 L_3 g_m s^3 + L_1 g_m s + R_1 g_m + s^2 (C_1 L_1 R_1 g_m + C_3 L_3 R_1 g_m)}{C_3 L_1 g_m s^2 + s^3 (C_1 C_3 L_1 R_1 g_m + C_1 C_3 L_1) + s (C_3 R_1 g_m + C_3)}$$

$$10.77 \quad \text{INVALID-ORDER-77} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_1 L_3 R_1 g_m s^3 + L_1 L_3 g_m s^2 + L_3 R_1 g_m s}{C_3 L_1 L_3 g_m s^3 + L_1 g_m s + R_1 g_m + s^4 (C_1 C_3 L_1 L_3 R_1 g_m + C_1 C_3 L_1 L_3) + s^2 (C_1 L_1 R_1 g_m + C_1 L_1 + C_3 L_3 R_1 g_m + C_3 L_3) + 1}$$

$$10.78 \quad \text{INVALID-ORDER-78} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad L_3 s + R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_1 L_3 R_1 g_m s^4 + R_1 g_m + s^3 (C_1 C_3 L_1 R_1 R_3 g_m + C_3 L_1 L_3 g_m) + s^2 (C_1 L_1 R_1 g_m + C_3 L_1 R_3 g_m + C_3 L_3 R_1 g_m) + s (C_3 R_1 R_3 g_m + L_1 g_m)}{C_3 L_1 g_m s^2 + s^3 (C_1 C_3 L_1 R_1 g_m + C_1 C_3 L_1) + s (C_3 R_1 g_m + C_3)}$$

$$10.79 \quad \text{INVALID-ORDER-79} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_1 L_3 R_1 R_3 g_m s^3 + L_1 L_3 R_3 g_m s^2 + L_3 R_1 R_3 g_m s}{R_1 R_3 g_m + R_3 + s^4 (C_1 C_3 L_1 L_3 R_1 R_3 g_m + C_1 C_3 L_1 L_3 R_3) + s^3 (C_1 L_1 L_3 R_1 g_m + C_1 L_1 L_3 + C_3 L_1 L_3 R_3 g_m) + s^2 (C_1 L_1 R_1 R_3 g_m + C_1 L_1 R_3 + C_3 L_3 R_1 R_3 g_m + C_3 L_3 R_3 + L_1 L_3 g_m) + s (L_1 R_3 g_m + L_3 R_1 g_m + L_3)}$$

$$10.80 \quad \text{INVALID-ORDER-80} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_1 L_3 R_1 R_3 g_m s^4 + R_1 R_3 g_m + s^3 (C_1 L_1 L_3 R_1 g_m + C_3 L_1 L_3 R_3 g_m) + s^2 (C_1 L_1 R_1 R_3 g_m + C_3 L_3 R_1 R_3 g_m + L_1 L_3 g_m) + s (L_1 R_3 g_m + L_3 R_1 g_m)}{C_3 L_1 L_3 g_m s^3 + L_1 g_m s + R_1 g_m + s^4 (C_1 C_3 L_1 L_3 R_1 g_m + C_1 C_3 L_1 L_3) + s^2 (C_1 L_1 R_1 g_m + C_1 L_1 + C_3 L_3 R_1 g_m + C_3 L_3) + 1}$$

$$10.81 \quad \text{INVALID-ORDER-81} \quad Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \infty, \quad \frac{R_3(C_3 L_3 s^2 + 1)}{C_3 L_3 s^2 + C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_1 L_3 R_1 R_3 g_m s^4 + C_3 L_1 L_3 R_3 g_m s^3 + L_1 R_3 g_m s + R_1 R_3 g_m + s^2 (C_1 L_1 R_1 R_3 g_m + C_3 L_3 R_1 R_3 g_m)}{R_1 g_m + s^4 (C_1 C_3 L_1 L_3 R_1 g_m + C_1 C_3 L_1 L_3) + s^3 (C_1 C_3 L_1 R_1 R_3 g_m + C_1 C_3 L_1 R_3 + C_3 L_1 L_3 g_m) + s^2 (C_1 L_1 R_1 g_m + C_1 L_1 + C_3 L_1 R_3 g_m + C_3 L_3 R_1 g_m + C_3 L_3) + s (C_3 R_1 R_3 g_m + C_3 R_3 + L_1 g_m) + 1}$$

$$10.82 \quad \text{INVALID-ORDER-82} \quad Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_1 R_1 g_m s^2 + R_1 g_m}{C_1 C_3 R_1 s^2 + s^3 (C_1 C_3 L_1 R_1 g_m + C_1 C_3 L_1) + s (C_3 R_1 g_m + C_3)}$$

$$10.83 \quad \text{INVALID-ORDER-83} \quad Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \frac{R_3}{C_3 R_3 s + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_1 R_1 R_3 g_m s^2 + R_1 R_3 g_m}{R_1 g_m + s^3 (C_1 C_3 L_1 R_1 R_3 g_m + C_1 C_3 L_1 R_3) + s^2 (C_1 C_3 R_1 R_3 + C_1 L_1 R_1 g_m + C_1 L_1) + s (C_1 R_1 + C_3 R_1 R_3 g_m + C_3 R_3) + 1}$$

$$10.84 \quad \text{INVALID-ORDER-84} \quad Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_1 R_1 R_3 g_m s^3 + C_1 L_1 R_1 g_m s^2 + C_3 R_1 R_3 g_m s + R_1 g_m}{C_1 C_3 R_1 s^2 + s^3 (C_1 C_3 L_1 R_1 g_m + C_1 C_3 L_1) + s (C_3 R_1 g_m + C_3)}$$

$$10.85 \quad \text{INVALID-ORDER-85} \quad Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad L_3 s + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_1 L_3 R_1 g_m s^4 + R_1 g_m + s^2 (C_1 L_1 R_1 g_m + C_3 L_3 R_1 g_m)}{C_1 C_3 R_1 s^2 + s^3 (C_1 C_3 L_1 R_1 g_m + C_1 C_3 L_1) + s (C_3 R_1 g_m + C_3)}$$

$$10.86 \quad \text{INVALID-ORDER-86} \quad Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_1 L_3 R_1 g_m s^3 + L_3 R_1 g_m s}{C_1 C_3 L_3 R_1 s^3 + C_1 R_1 s + R_1 g_m + s^4 (C_1 C_3 L_1 L_3 R_1 g_m + C_1 C_3 L_1 L_3) + s^2 (C_1 L_1 R_1 g_m + C_1 L_1 + C_3 L_3 R_1 g_m + C_3 L_3) + 1}$$

$$10.87 \quad \text{INVALID-ORDER-87} \quad Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad L_3 s + R_3 + \frac{1}{C_3 s}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_1 L_3 R_1 g_m s^4 + C_1 C_3 L_1 R_1 R_3 g_m s^3 + C_3 R_1 R_3 g_m s + R_1 g_m + s^2 (C_1 L_1 R_1 g_m + C_3 L_3 R_1 g_m)}{C_1 C_3 R_1 s^2 + s^3 (C_1 C_3 L_1 R_1 g_m + C_1 C_3 L_1) + s (C_3 R_1 g_m + C_3)}$$

$$10.88 \quad \text{INVALID-ORDER-88} \quad Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 L_1 L_3 R_1 R_3 g_m s^3 + L_3 R_1 R_3 g_m s}{R_1 R_3 g_m + R_3 + s^4 (C_1 C_3 L_1 L_3 R_1 R_3 g_m + C_1 C_3 L_1 L_3 R_3) + s^3 (C_1 C_3 L_3 R_1 R_3 + C_1 L_1 L_3 R_1 g_m + C_1 L_1 L_3) + s^2 (C_1 L_1 R_1 R_3 g_m + C_1 L_1 R_3 + C_1 L_3 R_1 + C_3 L_3 R_1 R_3 g_m + C_3 L_3 R_3) + s (C_1 R_1 R_3 + L_3 R_1 g_m + L_3)}$$

$$10.89 \quad \text{INVALID-ORDER-89} \quad Z(s) = \left(\frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \infty, \quad \frac{L_3 s}{C_3 L_3 s^2 + 1} + R_3, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1 C_3 L_1 L_3 R_1 R_3 g_m s^4 + C_1 L_1 L_3 R_1 g_m s^3 + L_3 R_1 g_m s + R_1 R_3 g_m + s^2 (C_1 L_1 R_1 R_3 g_m + C_3 L_3 R_1 R_3 g_m)}{C_1 C_3 L_3 R_1 s^3 + C_1 R_1 s + R_1 g_m + s^4 (C_1 C_3 L_1 L_3 R_1 g_m + C_1 C_3 L_1 L_3) + s^2 (C_1 L_1 R_1 g_m + C_1 L_1 + C_3 L_3 R_1 g_m + C_3 L_3) + 1}$$

10.90 INVALID-ORDER-90

$$Z(s) = \left(\frac{R_1(C_1L_1s^2+1)}{C_1L_1s^2+C_1R_1s+1}, \quad \infty, \quad \frac{R_3(C_3L_3s^2+1)}{C_3L_3s^2+C_3R_3s+1}, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_1C_3L_1L_3R_1R_3g_ms^4 + R_1R_3g_m + s^2\left(C_1L_1R_1R_3g_m + C_3L_3R_1R_3g_m\right)}{R_1g_m + s^4\left(C_1C_3L_1L_3R_1g_m + C_1C_3L_1L_3\right) + s^3\left(C_1C_3L_1R_1R_3g_m + C_1C_3L_1R_3 + C_1C_3L_3R_1\right) + s^2\left(C_1C_3R_1R_3 + C_1L_1R_1g_m + C_1L_1 + C_3L_3R_1g_m + C_3L_3\right) + s\left(C_1R_1 + C_3R_1R_3g_m + C_3R_3\right) + 1}$$

11 PolynomialError