

Filter Summary Report: TIA,simple,Z1,ZL

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Contents

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

$$H(s) = \frac{L_L R_1 R_L g_m s}{(R_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

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: $\frac{R_1 R_L g_m}{R_1 g_m + 1}$

Qz: 0

Wz: None

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

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

Parameters:

$$\begin{aligned}
\text{Q: } & \frac{C_L L_1 R_L g_m \sqrt{\frac{1}{C_L L_1 R_L g_m}}}{C_L R_L + L_1 g_m} \\
\text{wo: } & \sqrt{\frac{1}{C_L L_1 R_L g_m}} \\
\text{bandwidth: } & \frac{C_L R_L + L_1 g_m}{C_L L_1 R_L g_m} \\
\text{K-LP: } & 0 \\
\text{K-HP: } & 0 \\
\text{K-BP: } & \frac{L_1 R_L g_m}{C_L R_L + L_1 g_m} \\
\text{QZ: } & 0 \\
\text{Wz: } & \text{None}
\end{aligned}$$

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

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

Parameters:

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

$$\mathbf{3.4 \quad BP-4} \quad Z(s) = \left(\frac{1}{C_1 s + \frac{1}{R_1} + \frac{1}{L_1 s}}, \infty, \infty, \infty, \infty, R_L \right)$$

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

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: 0
 K-HP: 0
 K-BP: $\frac{R_1 R_L g_m}{R_1 g_m + 1}$
 QZ: 0
 Wz: None

4 LP

4.1 LP-1 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$

$$H(s) = \frac{R_L g_m}{(C_1 s + g_m)(C_L R_L s + 1)}$$

Parameters:

Q: $\frac{C_1 C_L R_L \sqrt{\frac{g_m}{C_1 C_L R_L}}}{C_1 + C_L R_L g_m}$
 wo: $\sqrt{\frac{g_m}{C_1 C_L R_L}}$
 bandwidth: $\frac{C_1 + C_L R_L g_m}{C_1 C_L R_L}$
 K-LP: R_L
 K-HP: 0
 K-BP: 0
 QZ: None
 Wz: None

4.2 LP-2 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$

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

Parameters:

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

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

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

Parameters:

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

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

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

Parameters:

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

5 BS

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

$$H(s) = \frac{R_1 R_L g_m (C_L L_L s^2 + 1)}{(R_1 g_m + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

Parameters:

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

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

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

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_L
 K-HP: R_L
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_1 L_1}}$

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

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

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: $\frac{R_1 R_L g_m}{R_1 g_m + 1}$
 K-HP: $\frac{R_1 R_L g_m}{R_1 g_m + 1}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_1 L_1}}$

6 GE

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

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

Parameters:

$$\begin{aligned} \text{Q: } & \frac{L_1 g_m \sqrt{\frac{1}{C_1 L_1}}}{R_1 g_m + 1} \\ \text{wo: } & \sqrt{\frac{1}{C_1 L_1}} \\ \text{bandwidth: } & \frac{R_1 g_m + 1}{L_1 g_m} \\ \text{K-LP: } & R_L \\ \text{K-HP: } & R_L \\ \text{K-BP: } & \frac{R_1 R_L g_m}{R_1 g_m + 1} \\ \text{QZ: } & \frac{L_1 \sqrt{\frac{1}{C_1 L_1}}}{R_1} \\ \text{Wz: } & \sqrt{\frac{1}{C_1 L_1}} \end{aligned}$$

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

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

Parameters:

$$\begin{aligned} \text{Q: } & \frac{C_1 \sqrt{\frac{1}{C_1 L_1}} (R_1 g_m + 1)}{g_m} \\ \text{wo: } & \sqrt{\frac{1}{C_1 L_1}} \\ \text{bandwidth: } & \frac{g_m}{C_1 (R_1 g_m + 1)} \\ \text{K-LP: } & \frac{R_1 R_L g_m}{R_1 g_m + 1} \\ \text{K-HP: } & \frac{R_1 R_L g_m}{R_1 g_m + 1} \\ \text{K-BP: } & R_L \end{aligned}$$

$$\begin{aligned} \text{Qz: } & C_1 R_1 \sqrt{\frac{1}{C_1 L_1}} \\ \text{Wz: } & \sqrt{\frac{1}{C_1 L_1}} \end{aligned}$$

7 AP

8 INVALID-NUMER

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

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

Parameters:

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

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

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

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: $\frac{L_1 g_m}{C_L}$
 K-HP: 0
 K-BP: R_L
 Qz: 0
 Wz: None

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

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

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: $\frac{L_1 g_m}{C_L}$
 K-HP: 0
 K-BP: $\frac{R_1 R_L g_m}{R_1 g_m + 1}$
 Qz: 0
 Wz: None

9 INVALID-WZ

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

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

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: $\frac{L_1 g_m}{C_L}$
 K-HP: $\frac{L_L g_m}{C_1}$
 K-BP: 0
 Qz: None
 Wz: $\sqrt{\frac{1}{C_L L_L}}$

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

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

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: $\frac{L_1 g_m}{C_L}$
 K-HP: $\frac{L_L g_m}{C_1}$
 K-BP: R_L
 Qz: $\frac{L_L \sqrt{\frac{1}{C_1 L_1}}}{R_L}$
 Wz: $\sqrt{\frac{1}{C_L L_L}}$

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

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

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: $\frac{L_1 g_m}{C_L}$

K-HP: $\frac{L_L g_m}{C_1}$

K-BP: 0

Qz: None

Wz: $\sqrt{\frac{1}{C_L L_L}}$

9.4 INVALID-WZ-4 $Z(s) = \left(\frac{1}{C_1 s + \frac{1}{R_1} + \frac{1}{L_1 s}}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$

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

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: $\frac{L_1 g_m}{C_L}$

K-HP: $\frac{L_L g_m}{C_1}$

K-BP: $\frac{R_1 R_L g_m}{R_1 g_m + 1}$

Qz: $\frac{L_L \sqrt{\frac{1}{C_1 L_1}}}{R_L}$

$$W_Z: \sqrt{\frac{1}{C_L L_L}}$$

10 INVALID-ORDER

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

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

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

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

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

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

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

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

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

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

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

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

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

$$H(s) = \frac{R_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (R_1 g_m + 1)}$$

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

$$H(s) = \frac{R_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(R_1 g_m + 1)(C_L L_L s^2 + 1)}$$

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

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

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

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

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

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

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

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

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

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

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

$$H(s) = \frac{L_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L (L_1 g_m s + 1)}$$

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

$$H(s) = \frac{L_1 L_L R_L g_m s^2}{(L_1 g_m s + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

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

$$H(s) = \frac{L_1 g_m s (C_L L_L R_L s^2 + L_L s + R_L)}{(C_L L_L s^2 + 1) (L_1 g_m s + 1)}$$

$$10.17 \quad \text{INVALID-ORDER-17} \quad Z(s) = \left(L_1 s, \infty, \infty, \infty, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s) = \frac{L_1 R_L g_m s (C_L L_L s^2 + 1)}{(L_1 g_m s + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

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

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

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

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

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

$$H(s) = \frac{g_m (C_L R_L s + 1)}{C_L s (C_1 s + g_m)}$$

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

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

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

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

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

$$H(s) = \frac{g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (C_1 s + g_m)}$$

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

$$H(s) = \frac{L_L R_L g_m s}{(C_1 s + g_m) (C_L L_L R_L s^2 + L_L s + R_L)}$$

10.25 INVALID-ORDER-25 $Z(s) = \left(\frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$

$$H(s) = \frac{g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(C_1 s + g_m) (C_L L_L s^2 + 1)}$$

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

$$H(s) = \frac{R_L g_m (C_L L_L s^2 + 1)}{(C_1 s + g_m) (C_L L_L s^2 + C_L R_L s + 1)}$$

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

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

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

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

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

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

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

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

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

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

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

$$H(s) = \frac{R_1 g_m (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (C_1 R_1 s + R_1 g_m + 1)}$$

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

$$H(s) = \frac{L_L R_1 R_L g_m s}{(C_1 R_1 s + R_1 g_m + 1) (C_L L_L R_L s^2 + L_L s + R_L)}$$

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

$$H(s) = \frac{R_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(C_L L_L s^2 + 1) (C_1 R_1 s + R_1 g_m + 1)}$$

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

$$H(s) = \frac{R_1 R_L g_m (C_L L_L s^2 + 1)}{(C_1 R_1 s + R_1 g_m + 1) (C_L L_L s^2 + C_L R_L s + 1)}$$

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

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

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

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

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

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

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

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

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

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

10.41 INVALID-ORDER-41 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$

$$H(s) = \frac{g_m (C_1 R_1 s + 1) (C_L L_L s^2 + C_L R_L s + 1)}{C_L s (C_1 R_1 g_m s + C_1 s + g_m)}$$

10.42 INVALID-ORDER-42 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$

$$H(s) = \frac{L_L R_L g_m s (C_1 R_1 s + 1)}{(C_1 R_1 g_m s + C_1 s + g_m) (C_L L_L R_L s^2 + L_L s + R_L)}$$

10.43 INVALID-ORDER-43 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$

$$H(s) = \frac{g_m (C_1 R_1 s + 1) (C_L L_L R_L s^2 + L_L s + R_L)}{(C_L L_L s^2 + 1) (C_1 R_1 g_m s + C_1 s + g_m)}$$

10.44 INVALID-ORDER-44 $Z(s) = \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$

$$H(s) = \frac{R_L g_m (C_1 R_1 s + 1) (C_L L_L s^2 + 1)}{(C_L L_L s^2 + C_L R_L s + 1) (C_1 R_1 g_m s + C_1 s + g_m)}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

10.65 INVALID-ORDER-65 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\begin{aligned}
10.73 \quad \text{INVALID-ORDER-73} \quad Z(s) &= \left(\frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right) \\
H(s) &= \frac{g_m (C_1 L_1 R_1 s^2 + L_1 s + R_1)}{C_L s (C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + L_1 g_m s + R_1 g_m + 1)}
\end{aligned}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

10.88 INVALID-ORDER-88 $Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$

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

10.89 INVALID-ORDER-89 $Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$

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

10.90 INVALID-ORDER-90 $Z(s) = \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$

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