

# Filter Summary Report: TIA,simple,Z1,Z2

Generated by MacAnalog-Symbolix

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10.59INVALID-ORDER-59	$Z(s) = \left( L_1 s + R_1 + \frac{1}{C_1 s}, L_2 s + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$	11
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10.80INVALID-ORDER-80	$Z(s) = \left( \frac{R_1(C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \frac{R_2(C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$	13

1    Examined  $H(z)$  for TIA simple **Z1 Z2:**  $Z_1 (Z_2 g_m + 1)$

$$H(z) = Z_1 (Z_2 g_m + 1)$$

2    HP

3    BP

3.1    **BP-1**  $Z(s) = \left( \frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \ R_2, \ \infty, \ \infty, \ \infty, \ \infty \right)$

$$H(s) = \frac{L_1 R_1 s (R_2 g_m + 1)}{C_1 L_1 R_1 s^2 + L_1 s + R_1}$$

**Parameters:**

Q:  $C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}$   
wo:  $\sqrt{\frac{1}{C_1 L_1}}$   
bandwidth:  $\frac{1}{C_1 R_1}$   
K-LP: 0  
K-HP: 0  
K-BP:  $R_1 (R_2 g_m + 1)$   
Qz: 0  
Wz: None

4    LP

5    BS

5.1    **BS-1**  $Z(s) = \left( \frac{R_1 (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \ R_2, \ \infty, \ \infty, \ \infty, \ \infty \right)$

$$H(s) = \frac{R_1 (R_2 g_m + 1) (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}$$

**Parameters:**

Q:  $\frac{L_1 \sqrt{\frac{1}{C_1 L_1}}}{R_1}$   
wo:  $\sqrt{\frac{1}{C_1 L_1}}$   
bandwidth:  $\frac{R_1}{L_1}$   
K-LP:  $R_1 (R_2 g_m + 1)$   
K-HP:  $R_1 (R_2 g_m + 1)$   
K-BP: 0  
Qz: None  
Wz:  $\sqrt{\frac{1}{C_1 L_1}}$

6    GE

**6.1 GE-1**  $Z(s) = \left( R_1, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{R_1 (C_2L_2R_2g_ms^2 + C_2L_2s^2 + C_2R_2s + R_2g_m + 1)}{C_2L_2s^2 + C_2R_2s + 1}$$

**Parameters:**

Q:  $\frac{L_2\sqrt{\frac{1}{C_2L_2}}}{R_2}$   
 wo:  $\sqrt{\frac{1}{C_2L_2}}$   
 bandwidth:  $\frac{R_2}{L_2}$   
 K-LP:  $R_1 (R_2g_m + 1)$   
 K-HP:  $R_1 (R_2g_m + 1)$   
 K-BP:  $R_1$   
 QZ:  $\frac{L_2\sqrt{\frac{1}{C_2L_2}}(R_2g_m+1)}{R_2}$   
 Wz:  $\sqrt{\frac{1}{C_2L_2}}$

## 7 AP

## 8 INVALID-NUMER

**8.1 INVALID-NUMER-1**  $Z(s) = \left( \frac{R_1}{C_1R_1s+1}, \frac{R_2}{C_2R_2s+1}, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{R_1 (C_2R_2s + R_2g_m + 1)}{(C_1R_1s + 1) (C_2R_2s + 1)}$$

**Parameters:**

Q:  $\frac{C_1C_2R_1R_2\sqrt{\frac{1}{C_1C_2R_1R_2}}}{C_1R_1+C_2R_2}$   
 wo:  $\sqrt{\frac{1}{C_1C_2R_1R_2}}$   
 bandwidth:  $\frac{C_1R_1+C_2R_2}{C_1C_2R_1R_2}$   
 K-LP:  $R_1 (R_2g_m + 1)$   
 K-HP: 0  
 K-BP:  $\frac{C_2R_1R_2}{C_1R_1+C_2R_2}$   
 QZ: 0  
 Wz: None

**8.2 INVALID-NUMER-2**  $Z(s) = \left( \frac{L_1R_1s}{C_1L_1R_1s^2+L_1s+R_1}, \frac{1}{C_2s}, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{L_1R_1 (C_2s + g_m)}{C_2 (C_1L_1R_1s^2 + L_1s + R_1)}$$

**Parameters:**

Q:  $C_1R_1\sqrt{\frac{1}{C_1L_1}}$   
 wo:  $\sqrt{\frac{1}{C_1L_1}}$   
 bandwidth:  $\frac{1}{C_1R_1}$   
 K-LP:  $\frac{L_1g_m}{C_2}$   
 K-HP: 0  
 K-BP:  $R_1$   
 QZ: 0  
 Wz: None

### 8.3 INVALID-NUMER-3 $Z(s) = \left( \frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, R_2 + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$

**Parameters:**

Q:  $C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}$   
 wo:  $\sqrt{\frac{1}{C_1 L_1}}$   
 bandwidth:  $\frac{1}{C_1 R_1}$   
 K-LP:  $\frac{L_1 g_m}{C_2}$   
 K-HP: 0  
 K-BP:  $R_1 (R_2 g_m + 1)$   
 Qz: 0  
 Wz: None

$$H(s) = \frac{L_1 R_1 (C_2 R_2 g_m s + C_2 s + g_m)}{C_2 (C_1 L_1 R_1 s^2 + L_1 s + R_1)}$$

## 9 INVALID-WZ

### 9.1 INVALID-WZ-1 $Z(s) = \left( \frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, L_2 s + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$

**Parameters:**

Q:  $C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}$   
 wo:  $\sqrt{\frac{1}{C_1 L_1}}$   
 bandwidth:  $\frac{1}{C_1 R_1}$   
 K-LP:  $\frac{L_1 g_m}{C_2}$   
 K-HP:  $\frac{L_2 g_m}{C_1}$   
 K-BP:  $R_1$   
 Qz:  $L_2 g_m \sqrt{\frac{1}{C_1 L_1}}$   
 Wz:  $\sqrt{\frac{1}{C_2 L_2}}$

$$H(s) = \frac{L_1 R_1 (C_2 L_2 g_m s^2 + C_2 s + g_m)}{C_2 (C_1 L_1 R_1 s^2 + L_1 s + R_1)}$$

### 9.2 INVALID-WZ-2 $Z(s) = \left( \frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, L_2 s + R_2 + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$

**Parameters:**

Q:  $C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}$   
 wo:  $\sqrt{\frac{1}{C_1 L_1}}$   
 bandwidth:  $\frac{1}{C_1 R_1}$   
 K-LP:  $\frac{L_1 g_m}{C_2}$   
 K-HP:  $\frac{L_2 g_m}{C_1}$   
 K-BP:  $R_1 (R_2 g_m + 1)$   
 Qz:  $\frac{L_2 g_m \sqrt{\frac{1}{C_1 L_1}}}{R_2 g_m + 1}$   
 Wz:  $\sqrt{\frac{1}{C_2 L_2}}$

$$H(s) = \frac{L_1 R_1 (C_2 L_2 g_m s^2 + C_2 R_2 g_m s + C_2 s + g_m)}{C_2 (C_1 L_1 R_1 s^2 + L_1 s + R_1)}$$

## 10 INVALID-ORDER

$$10.1 \quad \text{INVALID-ORDER-1} \quad Z(s) = (R_1, R_2, \infty, \infty, \infty, \infty)$$

$$H(s) = R_1 (R_2 g_m + 1)$$

$$10.2 \quad \text{INVALID-ORDER-2} \quad Z(s) = \left( R_1, \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1 (C_2 s + g_m)}{C_2 s}$$

$$10.3 \quad \text{INVALID-ORDER-3} \quad Z(s) = \left( R_1, \frac{R_2}{C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1 (C_2 R_2 s + R_2 g_m + 1)}{C_2 R_2 s + 1}$$

$$10.4 \quad \text{INVALID-ORDER-4} \quad Z(s) = \left( R_1, R_2 + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1 (C_2 R_2 g_m s + C_2 s + g_m)}{C_2 s}$$

$$10.5 \quad \text{INVALID-ORDER-5} \quad Z(s) = \left( R_1, L_2 s + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1 (C_2 L_2 g_m s^2 + C_2 s + g_m)}{C_2 s}$$

$$10.6 \quad \text{INVALID-ORDER-6} \quad Z(s) = \left( R_1, L_2 s + R_2 + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1 (C_2 L_2 g_m s^2 + C_2 R_2 g_m s + C_2 s + g_m)}{C_2 s}$$

$$10.7 \quad \text{INVALID-ORDER-7} \quad Z(s) = \left( R_1, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1 (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + L_2 g_m s + R_2 g_m + 1)}{C_2 L_2 s^2 + 1}$$

$$10.8 \quad \text{INVALID-ORDER-8} \quad Z(s) = (L_1 s, R_2, \infty, \infty, \infty, \infty)$$

$$H(s) = L_1 s (R_2 g_m + 1)$$

$$10.9 \quad \text{INVALID-ORDER-9} \quad Z(s) = \left( L_1 s, \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{L_1 (C_2 s + g_m)}{C_2}$$

$$10.10 \quad \text{INVALID-ORDER-10} \quad Z(s) = \left( L_1 s, \frac{R_2}{C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{L_1 s (C_2 R_2 s + R_2 g_m + 1)}{C_2 R_2 s + 1}$$

$$10.11 \quad \text{INVALID-ORDER-11} \quad Z(s) = \left( L_1 s, \quad R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 (C_2 R_2 g_m s + C_2 s + g_m)}{C_2}$$

$$10.12 \quad \text{INVALID-ORDER-12} \quad Z(s) = \left( L_1 s, \quad L_2 s + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 (C_2 L_2 g_m s^2 + C_2 s + g_m)}{C_2}$$

$$10.13 \quad \text{INVALID-ORDER-13} \quad Z(s) = \left( L_1 s, \quad L_2 s + R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 (C_2 L_2 g_m s^2 + C_2 R_2 g_m s + C_2 s + g_m)}{C_2}$$

$$10.14 \quad \text{INVALID-ORDER-14} \quad Z(s) = \left( L_1 s, \quad \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 s (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + L_2 g_m s + R_2 g_m + 1)}{C_2 L_2 s^2 + 1}$$

$$10.15 \quad \text{INVALID-ORDER-15} \quad Z(s) = \left( L_1 s, \quad \frac{R_2 (C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 s (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + C_2 R_2 s + R_2 g_m + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}$$

$$10.16 \quad \text{INVALID-ORDER-16} \quad Z(s) = \left( \frac{1}{C_1 s}, \quad R_2, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_2 g_m + 1}{C_1 s}$$

$$10.17 \quad \text{INVALID-ORDER-17} \quad Z(s) = \left( \frac{1}{C_1 s}, \quad \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2 s + g_m}{C_1 C_2 s^2}$$

$$10.18 \quad \text{INVALID-ORDER-18} \quad Z(s) = \left( \frac{1}{C_1 s}, \quad \frac{R_2}{C_2 R_2 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2 R_2 s + R_2 g_m + 1}{C_1 s (C_2 R_2 s + 1)}$$

$$10.19 \quad \text{INVALID-ORDER-19} \quad Z(s) = \left( \frac{1}{C_1 s}, \quad R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2 R_2 g_m s + C_2 s + g_m}{C_1 C_2 s^2}$$

$$10.20 \quad \text{INVALID-ORDER-20} \quad Z(s) = \left( \frac{1}{C_1 s}, \quad L_2 s + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2 L_2 g_m s^2 + C_2 s + g_m}{C_1 C_2 s^2}$$



$$\mathbf{10.21 \quad INVALID-ORDER-21} \quad Z(s) = \left( \frac{1}{C_1 s}, \quad L_2 s + R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2 L_2 g_m s^2 + C_2 R_2 g_m s + C_2 s + g_m}{C_1 C_2 s^2}$$

$$\mathbf{10.22 \quad INVALID-ORDER-22} \quad Z(s) = \left( \frac{1}{C_1 s}, \quad \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + L_2 g_m s + R_2 g_m + 1}{C_1 s (C_2 L_2 s^2 + 1)}$$

$$\mathbf{10.23 \quad INVALID-ORDER-23} \quad Z(s) = \left( \frac{1}{C_1 s}, \quad \frac{R_2 (C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + C_2 R_2 s + R_2 g_m + 1}{C_1 s (C_2 L_2 s^2 + C_2 R_2 s + 1)}$$

$$\mathbf{10.24 \quad INVALID-ORDER-24} \quad Z(s) = \left( \frac{R_1}{C_1 R_1 s + 1}, \quad R_2, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_1 (R_2 g_m + 1)}{C_1 R_1 s + 1}$$

$$\mathbf{10.25 \quad INVALID-ORDER-25} \quad Z(s) = \left( \frac{R_1}{C_1 R_1 s + 1}, \quad \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_1 (C_2 s + g_m)}{C_2 s (C_1 R_1 s + 1)}$$

$$\mathbf{10.26 \quad INVALID-ORDER-26} \quad Z(s) = \left( \frac{R_1}{C_1 R_1 s + 1}, \quad R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_1 (C_2 R_2 g_m s + C_2 s + g_m)}{C_2 s (C_1 R_1 s + 1)}$$

$$\mathbf{10.27 \quad INVALID-ORDER-27} \quad Z(s) = \left( \frac{R_1}{C_1 R_1 s + 1}, \quad L_2 s + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_1 (C_2 L_2 g_m s^2 + C_2 s + g_m)}{C_2 s (C_1 R_1 s + 1)}$$

$$\mathbf{10.28 \quad INVALID-ORDER-28} \quad Z(s) = \left( \frac{R_1}{C_1 R_1 s + 1}, \quad L_2 s + R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_1 (C_2 L_2 g_m s^2 + C_2 R_2 g_m s + C_2 s + g_m)}{C_2 s (C_1 R_1 s + 1)}$$

$$\mathbf{10.29 \quad INVALID-ORDER-29} \quad Z(s) = \left( \frac{R_1}{C_1 R_1 s + 1}, \quad \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_1 (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + L_2 g_m s + R_2 g_m + 1)}{(C_1 R_1 s + 1) (C_2 L_2 s^2 + 1)}$$

$$10.30 \quad \text{INVALID-ORDER-30} \quad Z(s) = \left( \frac{R_1}{C_1 R_1 s + 1}, \frac{R_2 (C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1 (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + C_2 R_2 s + R_2 g_m + 1)}{(C_1 R_1 s + 1) (C_2 L_2 s^2 + C_2 R_2 s + 1)}$$

$$10.31 \quad \text{INVALID-ORDER-31} \quad Z(s) = \left( R_1 + \frac{1}{C_1 s}, R_2, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{(R_2 g_m + 1) (C_1 R_1 s + 1)}{C_1 s}$$

$$10.32 \quad \text{INVALID-ORDER-32} \quad Z(s) = \left( R_1 + \frac{1}{C_1 s}, \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{(C_2 s + g_m) (C_1 R_1 s + 1)}{C_1 C_2 s^2}$$

$$10.33 \quad \text{INVALID-ORDER-33} \quad Z(s) = \left( R_1 + \frac{1}{C_1 s}, \frac{R_2}{C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{(C_1 R_1 s + 1) (C_2 R_2 s + R_2 g_m + 1)}{C_1 s (C_2 R_2 s + 1)}$$

$$10.34 \quad \text{INVALID-ORDER-34} \quad Z(s) = \left( R_1 + \frac{1}{C_1 s}, R_2 + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{(C_1 R_1 s + 1) (C_2 R_2 g_m s + C_2 s + g_m)}{C_1 C_2 s^2}$$

$$10.35 \quad \text{INVALID-ORDER-35} \quad Z(s) = \left( R_1 + \frac{1}{C_1 s}, L_2 s + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{(C_1 R_1 s + 1) (C_2 L_2 g_m s^2 + C_2 s + g_m)}{C_1 C_2 s^2}$$

$$10.36 \quad \text{INVALID-ORDER-36} \quad Z(s) = \left( R_1 + \frac{1}{C_1 s}, L_2 s + R_2 + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{(C_1 R_1 s + 1) (C_2 L_2 g_m s^2 + C_2 R_2 g_m s + C_2 s + g_m)}{C_1 C_2 s^2}$$

$$10.37 \quad \text{INVALID-ORDER-37} \quad Z(s) = \left( R_1 + \frac{1}{C_1 s}, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{(C_1 R_1 s + 1) (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + L_2 g_m s + R_2 g_m + 1)}{C_1 s (C_2 L_2 s^2 + 1)}$$

$$10.38 \quad \text{INVALID-ORDER-38} \quad Z(s) = \left( R_1 + \frac{1}{C_1 s}, \frac{R_2 (C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{(C_1 R_1 s + 1) (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + C_2 R_2 s + R_2 g_m + 1)}{C_1 s (C_2 L_2 s^2 + C_2 R_2 s + 1)}$$

$$10.39 \quad \text{INVALID-ORDER-39} \quad Z(s) = \left( L_1 s + \frac{1}{C_1 s}, \quad R_2, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(R_2 g_m + 1) (C_1 L_1 s^2 + 1)}{C_1 s}$$

$$10.40 \quad \text{INVALID-ORDER-40} \quad Z(s) = \left( L_1 s + \frac{1}{C_1 s}, \quad \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_2 s + g_m) (C_1 L_1 s^2 + 1)}{C_1 C_2 s^2}$$

$$10.41 \quad \text{INVALID-ORDER-41} \quad Z(s) = \left( L_1 s + \frac{1}{C_1 s}, \quad \frac{R_2}{C_2 R_2 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_1 L_1 s^2 + 1) (C_2 R_2 s + R_2 g_m + 1)}{C_1 s (C_2 R_2 s + 1)}$$

$$10.42 \quad \text{INVALID-ORDER-42} \quad Z(s) = \left( L_1 s + \frac{1}{C_1 s}, \quad R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_1 L_1 s^2 + 1) (C_2 R_2 g_m s + C_2 s + g_m)}{C_1 C_2 s^2}$$

$$10.43 \quad \text{INVALID-ORDER-43} \quad Z(s) = \left( L_1 s + \frac{1}{C_1 s}, \quad L_2 s + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_1 L_1 s^2 + 1) (C_2 L_2 g_m s^2 + C_2 s + g_m)}{C_1 C_2 s^2}$$

$$10.44 \quad \text{INVALID-ORDER-44} \quad Z(s) = \left( L_1 s + \frac{1}{C_1 s}, \quad L_2 s + R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_1 L_1 s^2 + 1) (C_2 L_2 g_m s^2 + C_2 R_2 g_m s + C_2 s + g_m)}{C_1 C_2 s^2}$$

$$10.45 \quad \text{INVALID-ORDER-45} \quad Z(s) = \left( L_1 s + \frac{1}{C_1 s}, \quad \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_1 L_1 s^2 + 1) (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + L_2 g_m s + R_2 g_m + 1)}{C_1 s (C_2 L_2 s^2 + 1)}$$

$$10.46 \quad \text{INVALID-ORDER-46} \quad Z(s) = \left( L_1 s + \frac{1}{C_1 s}, \quad \frac{R_2 (C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_1 L_1 s^2 + 1) (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + C_2 R_2 s + R_2 g_m + 1)}{C_1 s (C_2 L_2 s^2 + C_2 R_2 s + 1)}$$

$$10.47 \quad \text{INVALID-ORDER-47} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1}, \quad R_2, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{L_1 s (R_2 g_m + 1)}{C_1 L_1 s^2 + 1}$$

$$10.48 \quad \text{INVALID-ORDER-48} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1}, \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{L_1 (C_2 s + g_m)}{C_2 (C_1 L_1 s^2 + 1)}$$

$$10.49 \quad \text{INVALID-ORDER-49} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1}, \frac{R_2}{C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{L_1 s (C_2 R_2 s + R_2 g_m + 1)}{(C_1 L_1 s^2 + 1) (C_2 R_2 s + 1)}$$

$$10.50 \quad \text{INVALID-ORDER-50} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1}, R_2 + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{L_1 (C_2 R_2 g_m s + C_2 s + g_m)}{C_2 (C_1 L_1 s^2 + 1)}$$

$$10.51 \quad \text{INVALID-ORDER-51} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1}, L_2 s + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{L_1 (C_2 L_2 g_m s^2 + C_2 s + g_m)}{C_2 (C_1 L_1 s^2 + 1)}$$

$$10.52 \quad \text{INVALID-ORDER-52} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1}, L_2 s + R_2 + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{L_1 (C_2 L_2 g_m s^2 + C_2 R_2 g_m s + C_2 s + g_m)}{C_2 (C_1 L_1 s^2 + 1)}$$

$$10.53 \quad \text{INVALID-ORDER-53} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1}, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{L_1 s (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + L_2 g_m s + R_2 g_m + 1)}{(C_1 L_1 s^2 + 1) (C_2 L_2 s^2 + 1)}$$

$$10.54 \quad \text{INVALID-ORDER-54} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1}, \frac{R_2 (C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{L_1 s (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + C_2 R_2 s + R_2 g_m + 1)}{(C_1 L_1 s^2 + 1) (C_2 L_2 s^2 + C_2 R_2 s + 1)}$$

$$10.55 \quad \text{INVALID-ORDER-55} \quad Z(s) = \left( L_1 s + R_1 + \frac{1}{C_1 s}, R_2, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{(R_2 g_m + 1) (C_1 L_1 s^2 + C_1 R_1 s + 1)}{C_1 s}$$

$$10.56 \quad \text{INVALID-ORDER-56} \quad Z(s) = \left( L_1 s + R_1 + \frac{1}{C_1 s}, \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{(C_2 s + g_m) (C_1 L_1 s^2 + C_1 R_1 s + 1)}{C_1 C_2 s^2}$$

**10.57 INVALID-ORDER-57**  $Z(s) = \left( L_1 s + R_1 + \frac{1}{C_1 s}, \frac{R_2}{C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{(C_1 L_1 s^2 + C_1 R_1 s + 1)(C_2 R_2 s + R_2 g_m + 1)}{C_1 s (C_2 R_2 s + 1)}$$

**10.58 INVALID-ORDER-58**  $Z(s) = \left( L_1 s + R_1 + \frac{1}{C_1 s}, R_2 + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{(C_1 L_1 s^2 + C_1 R_1 s + 1)(C_2 R_2 g_m s + C_2 s + g_m)}{C_1 C_2 s^2}$$

**10.59 INVALID-ORDER-59**  $Z(s) = \left( L_1 s + R_1 + \frac{1}{C_1 s}, L_2 s + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{(C_1 L_1 s^2 + C_1 R_1 s + 1)(C_2 L_2 g_m s^2 + C_2 s + g_m)}{C_1 C_2 s^2}$$

**10.60 INVALID-ORDER-60**  $Z(s) = \left( L_1 s + R_1 + \frac{1}{C_1 s}, L_2 s + R_2 + \frac{1}{C_2 s}, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{(C_1 L_1 s^2 + C_1 R_1 s + 1)(C_2 L_2 g_m s^2 + C_2 R_2 g_m s + C_2 s + g_m)}{C_1 C_2 s^2}$$

**10.61 INVALID-ORDER-61**  $Z(s) = \left( L_1 s + R_1 + \frac{1}{C_1 s}, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{(C_1 L_1 s^2 + C_1 R_1 s + 1)(C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + L_2 g_m s + R_2 g_m + 1)}{C_1 s (C_2 L_2 s^2 + 1)}$$

**10.62 INVALID-ORDER-62**  $Z(s) = \left( L_1 s + R_1 + \frac{1}{C_1 s}, \frac{R_2(C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{(C_1 L_1 s^2 + C_1 R_1 s + 1)(C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + C_2 R_2 s + R_2 g_m + 1)}{C_1 s (C_2 L_2 s^2 + C_2 R_2 s + 1)}$$

**10.63 INVALID-ORDER-63**  $Z(s) = \left( \frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \frac{R_2}{C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{L_1 R_1 s (C_2 R_2 s + R_2 g_m + 1)}{(C_2 R_2 s + 1)(C_1 L_1 R_1 s^2 + L_1 s + R_1)}$$

**10.64 INVALID-ORDER-64**  $Z(s) = \left( \frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{L_1 R_1 s (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + L_2 g_m s + R_2 g_m + 1)}{(C_2 L_2 s^2 + 1)(C_1 L_1 R_1 s^2 + L_1 s + R_1)}$$

**10.65 INVALID-ORDER-65**  $Z(s) = \left( \frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1}, \frac{R_2(C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \infty, \infty, \infty, \infty \right)$

$$H(s) = \frac{L_1 R_1 s (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + C_2 R_2 s + R_2 g_m + 1)}{(C_2 L_2 s^2 + C_2 R_2 s + 1)(C_1 L_1 R_1 s^2 + L_1 s + R_1)}$$

$$10.66 \quad \text{INVALID-ORDER-66} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad R_2, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(R_2 g_m + 1) (C_1 L_1 R_1 s^2 + L_1 s + R_1)}{C_1 L_1 s^2 + 1}$$

$$10.67 \quad \text{INVALID-ORDER-67} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_2 s + g_m) (C_1 L_1 R_1 s^2 + L_1 s + R_1)}{C_2 s (C_1 L_1 s^2 + 1)}$$

$$10.68 \quad \text{INVALID-ORDER-68} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \frac{R_2}{C_2 R_2 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_2 R_2 s + R_2 g_m + 1) (C_1 L_1 R_1 s^2 + L_1 s + R_1)}{(C_1 L_1 s^2 + 1) (C_2 R_2 s + 1)}$$

$$10.69 \quad \text{INVALID-ORDER-69} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_1 L_1 R_1 s^2 + L_1 s + R_1) (C_2 R_2 g_m s + C_2 s + g_m)}{C_2 s (C_1 L_1 s^2 + 1)}$$

$$10.70 \quad \text{INVALID-ORDER-70} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad L_2 s + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_1 L_1 R_1 s^2 + L_1 s + R_1) (C_2 L_2 g_m s^2 + C_2 s + g_m)}{C_2 s (C_1 L_1 s^2 + 1)}$$

$$10.71 \quad \text{INVALID-ORDER-71} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad L_2 s + R_2 + \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_1 L_1 R_1 s^2 + L_1 s + R_1) (C_2 L_2 g_m s^2 + C_2 R_2 g_m s + C_2 s + g_m)}{C_2 s (C_1 L_1 s^2 + 1)}$$

$$10.72 \quad \text{INVALID-ORDER-72} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_1 L_1 R_1 s^2 + L_1 s + R_1) (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + L_2 g_m s + R_2 g_m + 1)}{(C_1 L_1 s^2 + 1) (C_2 L_2 s^2 + 1)}$$

$$10.73 \quad \text{INVALID-ORDER-73} \quad Z(s) = \left( \frac{L_1 s}{C_1 L_1 s^2 + 1} + R_1, \quad \frac{R_2 (C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{(C_1 L_1 R_1 s^2 + L_1 s + R_1) (C_2 L_2 R_2 g_m s^2 + C_2 L_2 s^2 + C_2 R_2 s + R_2 g_m + 1)}{(C_1 L_1 s^2 + 1) (C_2 L_2 s^2 + C_2 R_2 s + 1)}$$

$$10.74 \quad \text{INVALID-ORDER-74} \quad Z(s) = \left( \frac{R_1 (C_1 L_1 s^2 + 1)}{C_1 L_1 s^2 + C_1 R_1 s + 1}, \quad \frac{1}{C_2 s}, \quad \infty, \quad \infty, \quad \infty, \quad \infty \right)$$

$$H(s) = \frac{R_1 (C_2 s + g_m) (C_1 L_1 s^2 + 1)}{C_2 s (C_1 L_1 s^2 + C_1 R_1 s + 1)}$$

$$10.75 \quad \text{INVALID-ORDER-75} \quad Z(s) = \left( \frac{R_1(C_1L_1s^2+1)}{C_1L_1s^2+C_1R_1s+1}, \frac{R_2}{C_2R_2s+1}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1(C_1L_1s^2+1)(C_2R_2s+R_2g_m+1)}{(C_2R_2s+1)(C_1L_1s^2+C_1R_1s+1)}$$

$$10.76 \quad \text{INVALID-ORDER-76} \quad Z(s) = \left( \frac{R_1(C_1L_1s^2+1)}{C_1L_1s^2+C_1R_1s+1}, R_2 + \frac{1}{C_2s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1(C_1L_1s^2+1)(C_2R_2g_ms+C_2s+g_m)}{C_2s(C_1L_1s^2+C_1R_1s+1)}$$

$$10.77 \quad \text{INVALID-ORDER-77} \quad Z(s) = \left( \frac{R_1(C_1L_1s^2+1)}{C_1L_1s^2+C_1R_1s+1}, L_2s + \frac{1}{C_2s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1(C_1L_1s^2+1)(C_2L_2g_ms^2+C_2s+g_m)}{C_2s(C_1L_1s^2+C_1R_1s+1)}$$

$$10.78 \quad \text{INVALID-ORDER-78} \quad Z(s) = \left( \frac{R_1(C_1L_1s^2+1)}{C_1L_1s^2+C_1R_1s+1}, L_2s + R_2 + \frac{1}{C_2s}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1(C_1L_1s^2+1)(C_2L_2g_ms^2+C_2R_2g_ms+C_2s+g_m)}{C_2s(C_1L_1s^2+C_1R_1s+1)}$$

$$10.79 \quad \text{INVALID-ORDER-79} \quad Z(s) = \left( \frac{R_1(C_1L_1s^2+1)}{C_1L_1s^2+C_1R_1s+1}, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1(C_1L_1s^2+1)(C_2L_2R_2g_ms^2+C_2L_2s^2+L_2g_ms+R_2g_m+1)}{(C_2L_2s^2+1)(C_1L_1s^2+C_1R_1s+1)}$$

$$10.80 \quad \text{INVALID-ORDER-80} \quad Z(s) = \left( \frac{R_1(C_1L_1s^2+1)}{C_1L_1s^2+C_1R_1s+1}, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, \infty, \infty, \infty \right)$$

$$H(s) = \frac{R_1(C_1L_1s^2+1)(C_2L_2R_2g_ms^2+C_2L_2s^2+C_2R_2s+R_2g_m+1)}{(C_1L_1s^2+C_1R_1s+1)(C_2L_2s^2+C_2R_2s+1)}$$

## 11 PolynomialError