

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

Generated by MacAnalog-Symbolix

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3.2	BP-2 $Z(s) = \left( \infty, \frac{1}{C_2s}, \infty, \frac{L_4R_4s}{C_4L_4R_4s^2+L_4s+R_4}, \infty, \infty \right)$	2
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10.21INVALID-ORDER-21	$Z(s) = \left( \infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s + \frac{1}{C_4s}, \infty, \infty \right)$	9
10.22INVALID-ORDER-22	$Z(s) = \left( \infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \infty \right)$	9
10.23INVALID-ORDER-23	$Z(s) = \left( \infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \infty \right)$	9
10.24INVALID-ORDER-24	$Z(s) = \left( \infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \infty \right)$	9
10.25INVALID-ORDER-25	$Z(s) = \left( \infty, R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \infty \right)$	9
10.26INVALID-ORDER-26	$Z(s) = \left( \infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \infty \right)$	9
10.27INVALID-ORDER-27	$Z(s) = \left( \infty, R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \infty \right)$	9
10.28INVALID-ORDER-28	$Z(s) = \left( \infty, R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \infty \right)$	9
10.29INVALID-ORDER-29	$Z(s) = \left( \infty, R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \infty \right)$	10
10.30INVALID-ORDER-30	$Z(s) = \left( \infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \infty \right)$	10
10.31INVALID-ORDER-31	$Z(s) = \left( \infty, R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \infty \right)$	10
10.32INVALID-ORDER-32	$Z(s) = \left( \infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \infty \right)$	10
10.33INVALID-ORDER-33	$Z(s) = \left( \infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, \infty \right)$	10
10.34INVALID-ORDER-34	$Z(s) = \left( \infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \infty \right)$	10
10.35INVALID-ORDER-35	$Z(s) = \left( \infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \infty \right)$	10
10.36INVALID-ORDER-36	$Z(s) = \left( \infty, L_2s + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \infty \right)$	10
10.37INVALID-ORDER-37	$Z(s) = \left( \infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \infty \right)$	10
10.38INVALID-ORDER-38	$Z(s) = \left( \infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \infty \right)$	10
10.39INVALID-ORDER-39	$Z(s) = \left( \infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \infty \right)$	11
10.40INVALID-ORDER-40	$Z(s) = \left( \infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \infty \right)$	11
10.41INVALID-ORDER-41	$Z(s) = \left( \infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \infty \right)$	11
10.42INVALID-ORDER-42	$Z(s) = \left( \infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \infty \right)$	11
10.43INVALID-ORDER-43	$Z(s) = \left( \infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \infty \right)$	11

10.44INVALID-ORDER-44	$Z(s) = \left( \infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \infty \right)$	11
10.45INVALID-ORDER-45	$Z(s) = \left( \infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \infty \right)$	11
10.46INVALID-ORDER-46	$Z(s) = \left( \infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \infty \right)$	11
10.47INVALID-ORDER-47	$Z(s) = \left( \infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \infty \right)$	11
10.48INVALID-ORDER-48	$Z(s) = \left( \infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \infty \right)$	11
10.49INVALID-ORDER-49	$Z(s) = \left( \infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, R_4, \infty, \infty \right)$	12
10.50INVALID-ORDER-50	$Z(s) = \left( \infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{1}{C_4s}, \infty, \infty \right)$	12
10.51INVALID-ORDER-51	$Z(s) = \left( \infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \infty \right)$	12
10.52INVALID-ORDER-52	$Z(s) = \left( \infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, R_4 + \frac{1}{C_4s}, \infty, \infty \right)$	12
10.53INVALID-ORDER-53	$Z(s) = \left( \infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, \infty \right)$	12
10.54INVALID-ORDER-54	$Z(s) = \left( \infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \infty \right)$	12
10.55INVALID-ORDER-55	$Z(s) = \left( \infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \infty \right)$	12
10.56INVALID-ORDER-56	$Z(s) = \left( \infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \infty \right)$	12
10.57INVALID-ORDER-57	$Z(s) = \left( \infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, R_4, \infty, \infty \right)$	12
10.58INVALID-ORDER-58	$Z(s) = \left( \infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, \frac{1}{C_4s}, \infty, \infty \right)$	12
10.59INVALID-ORDER-59	$Z(s) = \left( \infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \infty \right)$	13
10.60INVALID-ORDER-60	$Z(s) = \left( \infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, R_4 + \frac{1}{C_4s}, \infty, \infty \right)$	13
10.61INVALID-ORDER-61	$Z(s) = \left( \infty, \frac{R_2(C_2L_2s^2+1)}{C_2L_2s^2+C_2R_2s+1}, \infty, L_4s + \frac{1}{C_4s}, \infty, \infty \right)$	13
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# 1 Examined $H(z)$ for TIA simple Z2 Z4: $\frac{Z_4(Z_2g_m+1)}{2Z_2g_m+2}$

$$H(z) = \frac{Z_4 (Z_2g_m + 1)}{2Z_2g_m + 2}$$

## 2 HP

## 3 BP

### 3.1 BP-1

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

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

**Parameters:**

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

### 3.2 BP-2

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

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

**Parameters:**

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

### 3.3 BP-3

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

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

**Parameters:**

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

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

**Parameters:**

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

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

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

**Parameters:**

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

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

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

**Parameters:**

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

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

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

**Parameters:**

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

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

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

$$\mathbf{3.8 \quad BP-8} \quad Z(s) = \left( \infty, \frac{R_2(C_2 L_2 s^2 + 1)}{C_2 L_2 s^2 + C_2 R_2 s + 1}, \infty, \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2 + L_4 s + R_4}, \infty, \infty \right)$$

**Parameters:**

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

## 4 LP

## 5 BS

$$\mathbf{5.1 \quad BS-1} \quad Z(s) = \left( \infty, R_2, \infty, \frac{R_4(C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + C_4 R_4 s + 1}, \infty, \infty \right)$$

**Parameters:**

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

$$\mathbf{5.2 \quad BS-2} \quad Z(s) = \left( \infty, \frac{1}{C_2 s}, \infty, \frac{R_4(C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + C_4 R_4 s + 1}, \infty, \infty \right)$$

**Parameters:**

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

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

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

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

wo:  $\sqrt{\frac{1}{C_4 L_4}}$   
bandwidth:  $\frac{R_4}{L_4}$   
K-LP:  $\frac{R_4}{2}$   
K-HP:  $\frac{\tilde{R}_4}{2}$   
K-BP: 0  
Qz: None  
Wz:  $\sqrt{\frac{1}{C_4 L_4}}$

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

**Parameters:**

Q:  $\frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_4}$   
wo:  $\sqrt{\frac{1}{C_4 L_4}}$   
bandwidth:  $\frac{R_4}{L_4}$   
K-LP:  $\frac{R_4}{2}$   
K-HP:  $\frac{\tilde{R}_4}{2}$   
K-BP: 0  
Qz: None  
Wz:  $\sqrt{\frac{1}{C_4 L_4}}$

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

**Parameters:**

Q:  $\frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_4}$   
wo:  $\sqrt{\frac{1}{C_4 L_4}}$   
bandwidth:  $\frac{R_4}{L_4}$   
K-LP:  $\frac{R_4}{2}$   
K-HP:  $\frac{\tilde{R}_4}{2}$   
K-BP: 0  
Qz: None  
Wz:  $\sqrt{\frac{1}{C_4 L_4}}$

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

**Parameters:**

Q:  $\frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_4}$   
wo:  $\sqrt{\frac{1}{C_4 L_4}}$   
bandwidth:  $\frac{R_4}{L_4}$   
K-LP:  $\frac{R_4}{2}$   
K-HP:  $\frac{\tilde{R}_4}{2}$   
K-BP: 0

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

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

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

Qz: None  
Wz:  $\sqrt{\frac{1}{C_4 L_4}}$

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

**Parameters:**

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

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

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

**Parameters:**

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

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

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

**Parameters:**

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

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

## 6 GE



7    AP

8    INVALID-NUMER

9    INVALID-WZ

10   INVALID-ORDER

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

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

10.2   INVALID-ORDER-2  $Z(s) = \left(\infty, R_2, \infty, \frac{1}{C_4s}, \infty, \infty\right)$

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

10.3   INVALID-ORDER-3  $Z(s) = \left(\infty, R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \infty\right)$

$$H(s) = \frac{R_4}{2(C_4R_4s+1)}$$

10.4   INVALID-ORDER-4  $Z(s) = \left(\infty, R_2, \infty, R_4 + \frac{1}{C_4s}, \infty, \infty\right)$

$$H(s) = \frac{C_4R_4s+1}{2C_4s}$$

10.5   INVALID-ORDER-5  $Z(s) = \left(\infty, R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, \infty\right)$

$$H(s) = \frac{C_4L_4s^2+1}{2C_4s}$$

10.6   INVALID-ORDER-6  $Z(s) = \left(\infty, R_2, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \infty\right)$

$$H(s) = \frac{L_4s}{2(C_4L_4s^2+1)}$$

10.7   INVALID-ORDER-7  $Z(s) = \left(\infty, R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \infty\right)$

$$H(s) = \frac{C_4L_4s^2+C_4R_4s+1}{2C_4s}$$

10.8   INVALID-ORDER-8  $Z(s) = \left(\infty, R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \infty\right)$

$$H(s) = \frac{C_4L_4R_4s^2+L_4s+R_4}{2(C_4L_4s^2+1)}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$H(s) = \frac{C_4L_4s^2 + C_4R_4s + 1}{2C_4s}$$

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

$$H(s) = \frac{C_4L_4R_4s^2 + L_4s + R_4}{2(C_4L_4s^2 + 1)}$$

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

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

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

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

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

$$H(s) = \frac{R_4}{2(C_4R_4s + 1)}$$

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

$$H(s) = \frac{C_4R_4s + 1}{2C_4s}$$

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

$$H(s) = \frac{C_4L_4s^2 + 1}{2C_4s}$$

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

$$H(s) = \frac{L_4s}{2(C_4L_4s^2 + 1)}$$

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

$$H(s) = \frac{C_4L_4s^2 + C_4R_4s + 1}{2C_4s}$$

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

$$H(s) = \frac{C_4L_4R_4s^2 + L_4s + R_4}{2(C_4L_4s^2 + 1)}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$H(s) = \frac{R_4}{2(C_4R_4s+1)}$$

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

$$H(s) = \frac{C_4R_4s+1}{2C_4s}$$

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

$$H(s) = \frac{C_4L_4s^2+1}{2C_4s}$$

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

$$H(s) = \frac{L_4s}{2(C_4L_4s^2+1)}$$

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

$$H(s) = \frac{C_4L_4s^2 + C_4R_4s + 1}{2C_4s}$$

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

$$H(s) = \frac{C_4L_4R_4s^2 + L_4s + R_4}{2(C_4L_4s^2+1)}$$

## 11 PolynomialError