Filter Summary Report: TIA,simple,Z1,Z5

Generated by MacAnalog-Symbolix

December 10, 2024

Contents

1 Examined $H(z)$ for TIA simple Z1 Z5: $\frac{Z_1(Z_5 g_m - 1)}{2Z_1 g_m + 1}$

$$H(z) = \frac{Z_1\left(Z_5 g_m - 1\right)}{2Z_1 g_m + 1}$$

2 HP

3 BP

3.1 BP-1 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2 + 1},\ \infty,\ \infty,\ \infty,\ R_5,\ \infty\right)$

$$H(s) = \frac{L_1 s\left(R_5 g_m - 1\right)}{C_1 L_1 s^2 + 2L_1 g_m s + 1}$$

Parameters:

Q: $\frac{C_1\sqrt{\frac{1}{C_1 L_1}}}{2g_m}$
wo: $\sqrt{\frac{1}{C_1 L_1}}$
bandwidth: $\frac{2g_m}{C_1}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_5 g_m - 1}{2g_m}$
Qz: 0
Wz: None

3.2 BP-2 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1},\ \infty,\ \infty,\ \infty,\ R_5,\ \infty\right)$

$$H(s) = \frac{L_1 R_1 s\left(R_5 g_m - 1\right)}{C_1 L_1 R_1 s^2 + 2L_1 R_1 g_m s + L_1 s + R_1}$$

Parameters:

Q: $\frac{C_1 R_1\sqrt{\frac{1}{C_1 L_1}}}{2R_1 g_m + 1}$
wo: $\sqrt{\frac{1}{C_1 L_1}}$
bandwidth: $\frac{2R_1 g_m + 1}{C_1 R_1}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_1(R_5 g_m - 1)}{2R_1 g_m + 1}$
Qz: 0
Wz: None

4 LP

5 BS

5.1 BS-1 $Z(s) = \left(L_1 s + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ R_5,\ \infty\right)$

$$H(s) = \frac{\left(R_5 g_m - 1\right)\left(C_1 L_1 s^2 + 1\right)}{2 C_1 L_1 g_m s^2 + C_1 s + 2 g_m}$$

Parameters:

Q: $2 L_1 g_m \sqrt{\frac{1}{C_1 L_1}}$
wo: $\sqrt{\frac{1}{C_1 L_1}}$
bandwidth: $\frac{1}{2 L_1 g_m}$
K-LP: $\frac{R_5 g_m - 1}{2 g_m}$
K-HP: $\frac{R_5 g_m - 1}{2 g_m}$
K-BP: 0
Qz: None
Wz: $\sqrt{\frac{1}{C_1 L_1}}$

5.2 BS-2 $Z(s) = \left(\frac{R_1\left(C_1 L_1 s^2 + 1\right)}{C_1 L_1 s^2 + C_1 R_1 s + 1},\ \infty,\ \infty,\ \infty,\ R_5,\ \infty\right)$

$$H(s) = \frac{R_1\left(R_5 g_m - 1\right)\left(C_1 L_1 s^2 + 1\right)}{2 C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + C_1 R_1 s + 2 R_1 g_m + 1}$$

Parameters:

Q: $\frac{L_1 \sqrt{\frac{1}{C_1 L_1}} (2 R_1 g_m + 1)}{R_1}$
wo: $\sqrt{\frac{1}{C_1 L_1}}$
bandwidth: $\frac{R_1}{L_1 (2 R_1 g_m + 1)}$
K-LP: $\frac{R_1 (R_5 g_m - 1)}{2 R_1 g_m + 1}$
K-HP: $\frac{R_1 (R_5 g_m - 1)}{2 R_1 g_m + 1}$
K-BP: 0
Qz: None
Wz: $\sqrt{\frac{1}{C_1 L_1}}$

6 GE

6.1 GE-1 $Z(s) = \left(R_1,\ \infty,\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5},\ \infty\right)$

$$H(s) = -\frac{R_1\left(C_5 L_5 R_5 s^2 - L_5 R_5 g_m s + L_5 s + R_5\right)}{\left(2 R_1 g_m + 1\right)\left(C_5 L_5 R_5 s^2 + L_5 s + R_5\right)}$$

Parameters:

Q: $C_5 R_5 \sqrt{\frac{1}{C_5 L_5}}$
wo: $\sqrt{\frac{1}{C_5 L_5}}$
bandwidth: $\frac{1}{C_5 R_5}$
K-LP: $-\frac{R_1}{2 R_1 g_m + 1}$
K-HP: $-\frac{R_1}{2 R_1 g_m + 1}$
K-BP: $\frac{R_1 (R_5 g_m - 1)}{2 R_1 g_m + 1}$
Qz: $-\frac{C_5 R_5 \sqrt{\frac{1}{C_5 L_5}}}{R_5 g_m - 1}$
Wz: $\sqrt{\frac{1}{C_5 L_5}}$

6.2 GE-2 $Z(s) = \left(R_1,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1},\ \infty\right)$

$$H(s) = -\frac{R_1\left(-C_5L_5R_5g_ms^2 + C_5L_5s^2 + C_5R_5s - R_5g_m + 1\right)}{\left(2R_1g_m + 1\right)\left(C_5L_5s^2 + C_5R_5s + 1\right)}$$

Parameters:

Q: $\frac{L_5\sqrt{\frac{1}{C_5L_5}}}{R_5}$
wo: $\sqrt{\frac{1}{C_5L_5}}$
bandwidth: $\frac{R_5}{L_5}$
K-LP: $\frac{R_1(R_5g_m-1)}{2R_1g_m+1}$
K-HP: $\frac{R_1(R_5g_m-1)}{2R_1g_m+1}$
K-BP: $-\frac{R_1}{2R_1g_m+1}$
Qz: $\frac{L_5\sqrt{\frac{1}{C_5L_5}}(-R_5g_m+1)}{R_5}$
Wz: $\sqrt{\frac{1}{C_5L_5}}$

6.3 GE-3 $Z(s) = \left(L_1s + R_1 + \frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ R_5,\ \infty\right)$

$$H(s) = \frac{\left(R_5g_m - 1\right)\left(C_1L_1s^2 + C_1R_1s + 1\right)}{2C_1L_1g_ms^2 + 2C_1R_1g_ms + C_1s + 2g_m}$$

Parameters:

Q: $\frac{2L_1g_m\sqrt{\frac{1}{C_1L_1}}}{2R_1g_m+1}$
wo: $\sqrt{\frac{1}{C_1L_1}}$
bandwidth: $\frac{2R_1g_m+1}{2L_1g_m}$
K-LP: $\frac{R_5g_m-1}{2g_m}$
K-HP: $\frac{R_5g_m-1}{2g_m}$
K-BP: $\frac{R_1(R_5g_m-1)}{2R_1g_m+1}$
Qz: $\frac{L_1\sqrt{\frac{1}{C_1L_1}}}{R_1}$
Wz: $\sqrt{\frac{1}{C_1L_1}}$

6.4 GE-4 $Z(s) = \left(\frac{L_1s}{C_1L_1s^2+1} + R_1,\ \infty,\ \infty,\ \infty,\ R_5,\ \infty\right)$

$$H(s) = \frac{\left(R_5g_m - 1\right)\left(C_1L_1R_1s^2 + L_1s + R_1\right)}{2C_1L_1R_1g_ms^2 + C_1L_1s^2 + 2L_1g_ms + 2R_1g_m + 1}$$

Parameters:

Q: $\frac{C_1\sqrt{\frac{1}{C_1L_1}}(2R_1g_m+1)}{2g_m}$
wo: $\sqrt{\frac{1}{C_1L_1}}$
bandwidth: $\frac{2g_m}{C_1(2R_1g_m+1)}$
K-LP: $\frac{R_1(R_5g_m-1)}{2R_1g_m+1}$
K-HP: $\frac{R_1(R_5g_m-1)}{2R_1g_m+1}$
K-BP: $\frac{R_5g_m-1}{2g_m}$
Qz: $C_1R_1\sqrt{\frac{1}{C_1L_1}}$
Wz: $\sqrt{\frac{1}{C_1L_1}}$

7 AP

8 INVALID-NUMER

8.1 INVALID-NUMER-1 $Z(s) = \left(L_1 s,\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{L_1 s\left(C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_5 R_5 s + 1\right)\left(2 L_1 g_m s + 1\right)}$$

Parameters:

Q: $\frac{\sqrt{2} C_5 L_1 R_5 g_m \sqrt{\frac{1}{C_5 L_1 R_5 g_m}}}{C_5 R_5 + 2 L_1 g_m}$
wo: $\frac{\sqrt{2}\sqrt{\frac{1}{C_5 L_1 R_5 g_m}}}{2}$
bandwidth: $\frac{C_5 R_5 + 2 L_1 g_m}{2 C_5 L_1 R_5 g_m}$
K-LP: 0
K-HP: $-\frac{1}{2 g_m}$
K-BP: $\frac{L_1 (R_5 g_m - 1)}{C_5 R_5 + 2 L_1 g_m}$
Qz: $-\frac{\sqrt{2} C_5 R_5 \sqrt{\frac{1}{C_5 L_1 R_5 g_m}}}{2 R_5 g_m - 2}$
Wz: None

8.2 INVALID-NUMER-2 $Z(s) = \left(\frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = \frac{-C_5 R_5 s + R_5 g_m - 1}{\left(C_1 s + 2 g_m\right)\left(C_5 R_5 s + 1\right)}$$

Parameters:

Q: $\frac{\sqrt{2} C_1 C_5 R_5 \sqrt{\frac{g_m}{C_1 C_5 R_5}}}{C_1 + 2 C_5 R_5 g_m}$
wo: $\sqrt{2}\sqrt{\frac{g_m}{C_1 C_5 R_5}}$
bandwidth: $\frac{C_1 + 2 C_5 R_5 g_m}{C_1 C_5 R_5}$
K-LP: $\frac{R_5 g_m - 1}{2 g_m}$
K-HP: 0
K-BP: $-\frac{C_5 R_5}{C_1 + 2 C_5 R_5 g_m}$
Qz: 0
Wz: None

8.3 INVALID-NUMER-3 $Z(s) = \left(\frac{R_1}{C_1 R_1 s+1},\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{R_1\left(C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_5 R_5 s + 1\right)\left(C_1 R_1 s + 2 R_1 g_m + 1\right)}$$

Parameters:

Q: $\frac{C_1 C_5 R_1 R_5 \sqrt{\frac{2 R_1 g_m + 1}{C_1 C_5 R_1 R_5}}}{C_1 R_1 + 2 C_5 R_1 R_5 g_m + C_5 R_5}$
wo: $\sqrt{\frac{2 R_1 g_m + 1}{C_1 C_5 R_1 R_5}}$
bandwidth: $\frac{C_1 R_1 + 2 C_5 R_1 R_5 g_m + C_5 R_5}{C_1 C_5 R_1 R_5}$
K-LP: $\frac{R_1 (R_5 g_m - 1)}{2 R_1 g_m + 1}$
K-HP: 0
K-BP: $-\frac{C_5 R_1 R_5}{C_1 R_1 + 2 C_5 R_1 R_5 g_m + C_5 R_5}$
Qz: 0
Wz: None

8.4 INVALID-NUMER-4 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1},\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1\left(-C_5 s + g_m\right)}{C_5\left(C_1 L_1 s^2 + 2 L_1 g_m s + 1\right)}$$

Parameters:

Q: $\frac{C_1\sqrt{\frac{1}{C_1 L_1}}}{2g_m}$
wo: $\sqrt{\frac{1}{C_1 L_1}}$
bandwidth: $\frac{2g_m}{C_1}$
K-LP: $\frac{L_1 g_m}{C_5}$
K-HP: 0
K-BP: $-\frac{1}{2g_m}$
Qz: 0
Wz: None

8.5 INVALID-NUMER-5 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1},\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1\left(C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5\left(C_1 L_1 s^2 + 2 L_1 g_m s + 1\right)}$$

Parameters:

Q: $\frac{C_1\sqrt{\frac{1}{C_1 L_1}}}{2g_m}$
wo: $\sqrt{\frac{1}{C_1 L_1}}$
bandwidth: $\frac{2g_m}{C_1}$
K-LP: $\frac{L_1 g_m}{C_5}$
K-HP: 0
K-BP: $\frac{R_5 g_m - 1}{2g_m}$
Qz: 0
Wz: None

8.6 INVALID-NUMER-6 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2+L_1 s+R_1},\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1 R_1\left(-C_5 s + g_m\right)}{C_5\left(C_1 L_1 R_1 s^2 + 2 L_1 R_1 g_m s + L_1 s + R_1\right)}$$

Parameters:

Q: $\frac{C_1 R_1\sqrt{\frac{1}{C_1 L_1}}}{2R_1 g_m+1}$
wo: $\sqrt{\frac{1}{C_1 L_1}}$
bandwidth: $\frac{2R_1 g_m+1}{C_1 R_1}$
K-LP: $\frac{L_1 g_m}{C_5}$
K-HP: 0
K-BP: $-\frac{R_1}{2R_1 g_m+1}$
Qz: 0
Wz: None

8.7 INVALID-NUMER-7 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2+L_1 s+R_1},\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1 R_1\left(C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5\left(C_1 L_1 R_1 s^2 + 2 L_1 R_1 g_m s + L_1 s + R_1\right)}$$

Parameters:

Q: $\frac{C_1 R_1\sqrt{\frac{1}{C_1 L_1}}}{2R_1 g_m+1}$

wo: $\sqrt{\frac{1}{C_1 L_1}}$
bandwidth: $\frac{2R_1 g_m+1}{C_1 R_1}$
K-LP: $\frac{L_1 g_m}{C_5}$
K-HP: 0
K-BP: $\frac{R_1(R_5 g_m-1)}{2R_1 g_m+1}$
Qz: 0
Wz: None

9 INVALID-WZ

9.1 INVALID-WZ-1 $Z(s) = \left(R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{(C_1 R_1 s+1)(C_5 R_5 s - R_5 g_m + 1)}{(C_5 R_5 s+1)(2C_1 R_1 g_m s + C_1 s + 2g_m)}$$

Parameters:

Q: $\frac{\sqrt{2}C_1 C_5 R_5 \sqrt{\frac{g_m}{C_1 C_5 R_5 (2R_1 g_m+1)}}(2R_1 g_m+1)}{2C_1 R_1 g_m + C_1 + 2C_5 R_5 g_m}$
wo: $\sqrt{2}\sqrt{\frac{g_m}{C_1 C_5 R_5 (2R_1 g_m+1)}}$
bandwidth: $\frac{2C_1 R_1 g_m + C_1 + 2C_5 R_5 g_m}{C_1 C_5 R_5 (2R_1 g_m+1)}$
K-LP: $\frac{R_5 g_m - 1}{2g_m}$
K-HP: $-\frac{R_1}{2R_1 g_m+1}$
K-BP: $\frac{C_1 R_1 R_5 g_m - C_1 R_1 - C_5 R_5}{2C_1 R_1 g_m + C_1 + 2C_5 R_5 g_m}$
Qz: $\frac{\sqrt{2}C_1 C_5 R_1 R_5 \sqrt{\frac{g_m}{C_1 C_5 R_5 (2R_1 g_m+1)}}}{-C_1 R_1 R_5 g_m + C_1 R_1 + C_5 R_5}$
Wz: $\sqrt{\frac{-R_5 g_m+1}{C_1 C_5 R_1 R_5}}$

9.2 INVALID-WZ-2 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1},\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1\left(C_5 L_5 g_m s^2 - C_5 s + g_m\right)}{C_5\left(C_1 L_1 s^2 + 2L_1 g_m s + 1\right)}$$

Parameters:

Q: $\frac{C_1\sqrt{\frac{1}{C_1 L_1}}}{2g_m}$
wo: $\sqrt{\frac{1}{C_1 L_1}}$
bandwidth: $\frac{2g_m}{C_1}$
K-LP: $\frac{L_1 g_m}{C_5}$
K-HP: $\frac{L_5 g_m}{C_1}$
K-BP: $-\frac{1}{2g_m}$
Qz: $-L_5 g_m \sqrt{\frac{1}{C_1 L_1}}$
Wz: $\sqrt{\frac{1}{C_5 L_5}}$

9.3 INVALID-WZ-3 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1},\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1\left(C_5 L_5 g_m s^2 + C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5\left(C_1 L_1 s^2 + 2L_1 g_m s + 1\right)}$$

Parameters:

Q: $\frac{C_1\sqrt{\frac{1}{C_1 L_1}}}{2g_m}$
wo: $\sqrt{\frac{1}{C_1 L_1}}$

bandwidth: $\frac{2g_m}{C_1}$
K-LP: $\frac{L_1 g_m}{C_5}$
K-HP: $\frac{L_5 g_m}{C_1}$
K-BP: $\frac{R_5 g_m - 1}{2g_m}$
Qz: $\frac{L_5 g_m \sqrt{\frac{1}{C_1 L_1}}}{R_5 g_m - 1}$
Wz: $\sqrt{\frac{1}{C_5 L_5}}$

9.4 INVALID-WZ-4 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1},\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1 R_1 \left(C_5 L_5 g_m s^2 - C_5 s + g_m\right)}{C_5 \left(C_1 L_1 R_1 s^2 + 2 L_1 R_1 g_m s + L_1 s + R_1\right)}$$

Parameters:

Q: $\frac{C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}}{2R_1 g_m + 1}$
wo: $\sqrt{\frac{1}{C_1 L_1}}$
bandwidth: $\frac{2R_1 g_m + 1}{C_1 R_1}$
K-LP: $\frac{L_1 g_m}{C_5}$
K-HP: $\frac{L_5 g_m}{C_1}$
K-BP: $-\frac{R_1}{2R_1 g_m + 1}$
Qz: $-L_5 g_m \sqrt{\frac{1}{C_1 L_1}}$
Wz: $\sqrt{\frac{1}{C_5 L_5}}$

9.5 INVALID-WZ-5 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2 + L_1 s + R_1},\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1 R_1 \left(C_5 L_5 g_m s^2 + C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 \left(C_1 L_1 R_1 s^2 + 2 L_1 R_1 g_m s + L_1 s + R_1\right)}$$

Parameters:

Q: $\frac{C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}}{2R_1 g_m + 1}$
wo: $\sqrt{\frac{1}{C_1 L_1}}$
bandwidth: $\frac{2R_1 g_m + 1}{C_1 R_1}$
K-LP: $\frac{L_1 g_m}{C_5}$
K-HP: $\frac{L_5 g_m}{C_1}$
K-BP: $\frac{R_1 (R_5 g_m - 1)}{2R_1 g_m + 1}$
Qz: $\frac{L_5 g_m \sqrt{\frac{1}{C_1 L_1}}}{R_5 g_m - 1}$
Wz: $\sqrt{\frac{1}{C_5 L_5}}$

10 INVALID-ORDER

10.1 INVALID-ORDER-1 $Z(s) = (R_1,\ \infty,\ \infty,\ \infty,\ R_5,\ \infty)$

$$H(s) = \frac{R_1 \left(R_5 g_m - 1\right)}{2R_1 g_m + 1}$$

10.2 INVALID-ORDER-2 $Z(s) = \left(R_1,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{R_1\left(-C_5 s + g_m\right)}{C_5 s\left(2R_1 g_m + 1\right)}$$

10.3 INVALID-ORDER-3 $Z(s) = \left(R_1,\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{R_1\left(C_5 R_5 s - R_5 g_m + 1\right)}{\left(2R_1 g_m + 1\right)\left(C_5 R_5 s + 1\right)}$$

10.4 INVALID-ORDER-4 $Z(s) = \left(R_1,\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{R_1\left(C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s\left(2R_1 g_m + 1\right)}$$

10.5 INVALID-ORDER-5 $Z(s) = \left(R_1,\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{R_1\left(C_5 L_5 g_m s^2 - C_5 s + g_m\right)}{C_5 s\left(2R_1 g_m + 1\right)}$$

10.6 INVALID-ORDER-6 $Z(s) = \left(R_1,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = -\frac{R_1\left(C_5 L_5 s^2 - L_5 g_m s + 1\right)}{\left(2R_1 g_m + 1\right)\left(C_5 L_5 s^2 + 1\right)}$$

10.7 INVALID-ORDER-7 $Z(s) = \left(R_1,\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{R_1\left(C_5 L_5 g_m s^2 + C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s\left(2R_1 g_m + 1\right)}$$

10.8 INVALID-ORDER-8 $Z(s) = \left(R_1,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1} + R_5,\ \infty\right)$

$$H(s) = \frac{R_1\left(C_5 L_5 R_5 g_m s^2 - C_5 L_5 s^2 + L_5 g_m s + R_5 g_m - 1\right)}{\left(2R_1 g_m + 1\right)\left(C_5 L_5 s^2 + 1\right)}$$

10.9 INVALID-ORDER-9 $Z(s) = \left(L_1 s,\ \infty,\ \infty,\ \infty,\ R_5,\ \infty\right)$

$$H(s) = \frac{L_1 s\left(R_5 g_m - 1\right)}{2L_1 g_m s + 1}$$

10.10 INVALID-ORDER-10 $Z(s) = \left(L_1 s,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1\left(-C_5 s + g_m\right)}{C_5\left(2L_1 g_m s + 1\right)}$$

10.11 INVALID-ORDER-11 $Z(s) = \left(L_1 s,\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1\left(C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5\left(2L_1 g_m s + 1\right)}$$

10.12 INVALID-ORDER-12 $Z(s) = \left(L_1 s,\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1\left(C_5 L_5 g_m s^2 - C_5 s + g_m\right)}{C_5\left(2L_1 g_m s + 1\right)}$$

10.13 INVALID-ORDER-13 $Z(s) = \left(L_1 s,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = -\frac{L_1 s\left(C_5 L_5 s^2 - L_5 g_m s + 1\right)}{\left(C_5 L_5 s^2 + 1\right)\left(2L_1 g_m s + 1\right)}$$

10.14 INVALID-ORDER-14 $Z(s) = \left(L_1 s,\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_1\left(C_5 L_5 g_m s^2 + C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5\left(2L_1 g_m s + 1\right)}$$

10.15 INVALID-ORDER-15 $Z(s) = \left(L_1 s,\ \infty,\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty\right)$

$$H(s) = -\frac{L_1 s\left(C_5 L_5 R_5 s^2 - L_5 R_5 g_m s + L_5 s + R_5\right)}{\left(2L_1 g_m s + 1\right)\left(C_5 L_5 R_5 s^2 + L_5 s + R_5\right)}$$

10.16 INVALID-ORDER-16 $Z(s) = \left(L_1 s,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1} + R_5,\ \infty\right)$

$$H(s) = \frac{L_1 s\left(C_5 L_5 R_5 g_m s^2 - C_5 L_5 s^2 + L_5 g_m s + R_5 g_m - 1\right)}{\left(C_5 L_5 s^2 + 1\right)\left(2L_1 g_m s + 1\right)}$$

10.17 INVALID-ORDER-17 $Z(s) = \left(L_1 s,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{L_1 s\left(-C_5 L_5 R_5 g_m s^2 + C_5 L_5 s^2 + C_5 R_5 s - R_5 g_m + 1\right)}{\left(2L_1 g_m s + 1\right)\left(C_5 L_5 s^2 + C_5 R_5 s + 1\right)}$$

10.18 INVALID-ORDER-18 $Z(s) = \left(\frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ R_5,\ \infty\right)$

$$H(s) = \frac{R_5 g_m - 1}{C_1 s + 2g_m}$$

10.19 INVALID-ORDER-19 $Z(s) = \left(\frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{-C_5 s + g_m}{C_5 s\left(C_1 s + 2g_m\right)}$$

10.20 INVALID-ORDER-20 $Z(s) = \left(\frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 R_5 g_m s - C_5 s + g_m}{C_5 s\left(C_1 s + 2g_m\right)}$$

10.21 INVALID-ORDER-21 $Z(s) = \left(\frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_5 g_m s^2 - C_5 s + g_m}{C_5 s \left(C_1 s + 2 g_m\right)}$$

10.22 INVALID-ORDER-22 $Z(s) = \left(\frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2 + 1},\ \infty\right)$

$$H(s) = \frac{-C_5 L_5 s^2 + L_5 g_m s - 1}{\left(C_1 s + 2 g_m\right)\left(C_5 L_5 s^2 + 1\right)}$$

10.23 INVALID-ORDER-23 $Z(s) = \left(\frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_5 g_m s^2 + C_5 R_5 g_m s - C_5 s + g_m}{C_5 s \left(C_1 s + 2 g_m\right)}$$

10.24 INVALID-ORDER-24 $Z(s) = \left(\frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5},\ \infty\right)$

$$H(s) = \frac{-C_5 L_5 R_5 s^2 + L_5 R_5 g_m s - L_5 s - R_5}{\left(C_1 s + 2 g_m\right)\left(C_5 L_5 R_5 s^2 + L_5 s + R_5\right)}$$

10.25 INVALID-ORDER-25 $Z(s) = \left(\frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2 + 1} + R_5,\ \infty\right)$

$$H(s) = \frac{C_5 L_5 R_5 g_m s^2 - C_5 L_5 s^2 + L_5 g_m s + R_5 g_m - 1}{\left(C_1 s + 2 g_m\right)\left(C_5 L_5 s^2 + 1\right)}$$

10.26 INVALID-ORDER-26 $Z(s) = \left(\frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2 + 1\right)}{C_5 L_5 s^2 + C_5 R_5 s + 1},\ \infty\right)$

$$H(s) = \frac{C_5 L_5 R_5 g_m s^2 - C_5 L_5 s^2 - C_5 R_5 s + R_5 g_m - 1}{\left(C_1 s + 2 g_m\right)\left(C_5 L_5 s^2 + C_5 R_5 s + 1\right)}$$

10.27 INVALID-ORDER-27 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1},\ \infty,\ \infty,\ \infty,\ R_5,\ \infty\right)$

$$H(s) = \frac{R_1\left(R_5 g_m - 1\right)}{C_1 R_1 s + 2 R_1 g_m + 1}$$

10.28 INVALID-ORDER-28 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1},\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{R_1\left(-C_5 s + g_m\right)}{C_5 s \left(C_1 R_1 s + 2 R_1 g_m + 1\right)}$$

10.29 INVALID-ORDER-29 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1},\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{R_1\left(C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s \left(C_1 R_1 s + 2 R_1 g_m + 1\right)}$$

10.30 INVALID-ORDER-30 $Z(s) = \left(\frac{R_1}{C_1 R_1 s + 1},\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{R_1\left(C_5 L_5 g_m s^2 - C_5 s + g_m\right)}{C_5 s \left(C_1 R_1 s + 2 R_1 g_m + 1\right)}$$

10.31 INVALID-ORDER-31 $Z(s) = \left(\frac{R_1}{C_1 R_1 s+1},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = -\frac{R_1\left(C_5 L_5 s^2 - L_5 g_m s + 1\right)}{\left(C_5 L_5 s^2 + 1\right)\left(C_1 R_1 s + 2R_1 g_m + 1\right)}$$

10.32 INVALID-ORDER-32 $Z(s) = \left(\frac{R_1}{C_1 R_1 s+1},\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{R_1\left(C_5 L_5 g_m s^2 + C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s\left(C_1 R_1 s + 2R_1 g_m + 1\right)}$$

10.33 INVALID-ORDER-33 $Z(s) = \left(\frac{R_1}{C_1 R_1 s+1},\ \infty,\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty\right)$

$$H(s) = -\frac{R_1\left(C_5 L_5 R_5 s^2 - L_5 R_5 g_m s + L_5 s + R_5\right)}{\left(C_1 R_1 s + 2R_1 g_m + 1\right)\left(C_5 L_5 R_5 s^2 + L_5 s + R_5\right)}$$

10.34 INVALID-ORDER-34 $Z(s) = \left(\frac{R_1}{C_1 R_1 s+1},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1} + R_5,\ \infty\right)$

$$H(s) = \frac{R_1\left(C_5 L_5 R_5 g_m s^2 - C_5 L_5 s^2 + L_5 g_m s + R_5 g_m - 1\right)}{\left(C_5 L_5 s^2 + 1\right)\left(C_1 R_1 s + 2R_1 g_m + 1\right)}$$

10.35 INVALID-ORDER-35 $Z(s) = \left(\frac{R_1}{C_1 R_1 s+1},\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{R_1\left(-C_5 L_5 R_5 g_m s^2 + C_5 L_5 s^2 + C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_1 R_1 s + 2R_1 g_m + 1\right)\left(C_5 L_5 s^2 + C_5 R_5 s + 1\right)}$$

10.36 INVALID-ORDER-36 $Z(s) = \left(R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ R_5,\ \infty\right)$

$$H(s) = \frac{\left(R_5 g_m - 1\right)\left(C_1 R_1 s + 1\right)}{2C_1 R_1 g_m s + C_1 s + 2g_m}$$

10.37 INVALID-ORDER-37 $Z(s) = \left(R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = -\frac{\left(C_5 s - g_m\right)\left(C_1 R_1 s + 1\right)}{C_5 s\left(2C_1 R_1 g_m s + C_1 s + 2g_m\right)}$$

10.38 INVALID-ORDER-38 $Z(s) = \left(R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{\left(C_1 R_1 s + 1\right)\left(C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s\left(2C_1 R_1 g_m s + C_1 s + 2g_m\right)}$$

10.39 INVALID-ORDER-39 $Z(s) = \left(R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{\left(C_1 R_1 s + 1\right)\left(C_5 L_5 g_m s^2 - C_5 s + g_m\right)}{C_5 s\left(2C_1 R_1 g_m s + C_1 s + 2g_m\right)}$$

10.40 INVALID-ORDER-40 $Z(s) = \left(R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = -\frac{(C_1 R_1 s + 1)\left(C_5 L_5 s^2 - L_5 g_m s + 1\right)}{(C_5 L_5 s^2 + 1)\left(2C_1 R_1 g_m s + C_1 s + 2g_m\right)}$$

10.41 INVALID-ORDER-41 $Z(s) = \left(R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{(C_1 R_1 s + 1)\left(C_5 L_5 g_m s^2 + C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s\left(2C_1 R_1 g_m s + C_1 s + 2g_m\right)}$$

10.42 INVALID-ORDER-42 $Z(s) = \left(R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty\right)$

$$H(s) = -\frac{(C_1 R_1 s + 1)\left(C_5 L_5 R_5 s^2 - L_5 R_5 g_m s + L_5 s + R_5\right)}{\left(2C_1 R_1 g_m s + C_1 s + 2g_m\right)\left(C_5 L_5 R_5 s^2 + L_5 s + R_5\right)}$$

10.43 INVALID-ORDER-43 $Z(s) = \left(R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1} + R_5,\ \infty\right)$

$$H(s) = \frac{(C_1 R_1 s + 1)\left(C_5 L_5 R_5 g_m s^2 - C_5 L_5 s^2 + L_5 g_m s + R_5 g_m - 1\right)}{(C_5 L_5 s^2 + 1)\left(2C_1 R_1 g_m s + C_1 s + 2g_m\right)}$$

10.44 INVALID-ORDER-44 $Z(s) = \left(R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{(C_1 R_1 s + 1)\left(-C_5 L_5 R_5 g_m s^2 + C_5 L_5 s^2 + C_5 R_5 s - R_5 g_m + 1\right)}{(C_5 L_5 s^2 + C_5 R_5 s + 1)\left(2C_1 R_1 g_m s + C_1 s + 2g_m\right)}$$

10.45 INVALID-ORDER-45 $Z(s) = \left(L_1 s + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = -\frac{(C_5 s - g_m)\left(C_1 L_1 s^2 + 1\right)}{C_5 s\left(2C_1 L_1 g_m s^2 + C_1 s + 2g_m\right)}$$

10.46 INVALID-ORDER-46 $Z(s) = \left(L_1 s + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{\left(C_1 L_1 s^2 + 1\right)(C_5 R_5 s - R_5 g_m + 1)}{(C_5 R_5 s + 1)\left(2C_1 L_1 g_m s^2 + C_1 s + 2g_m\right)}$$

10.47 INVALID-ORDER-47 $Z(s) = \left(L_1 s + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{\left(C_1 L_1 s^2 + 1\right)(C_5 R_5 g_m s - C_5 s + g_m)}{C_5 s\left(2C_1 L_1 g_m s^2 + C_1 s + 2g_m\right)}$$

10.48 INVALID-ORDER-48 $Z(s) = \left(L_1 s + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{\left(C_1 L_1 s^2 + 1\right)\left(C_5 L_5 g_m s^2 - C_5 s + g_m\right)}{C_5 s\left(2C_1 L_1 g_m s^2 + C_1 s + 2g_m\right)}$$

10.49 INVALID-ORDER-49 $Z(s) = \left(L_1 s + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = -\frac{\left(C_1 L_1 s^2+1\right)\left(C_5 L_5 s^2 - L_5 g_m s + 1\right)}{\left(C_5 L_5 s^2+1\right)\left(2C_1 L_1 g_m s^2 + C_1 s + 2g_m\right)}$$

10.50 INVALID-ORDER-50 $Z(s) = \left(L_1 s + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{\left(C_1 L_1 s^2+1\right)\left(C_5 L_5 g_m s^2 + C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s\left(2C_1 L_1 g_m s^2 + C_1 s + 2g_m\right)}$$

10.51 INVALID-ORDER-51 $Z(s) = \left(L_1 s + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty\right)$

$$H(s) = -\frac{\left(C_1 L_1 s^2+1\right)\left(C_5 L_5 R_5 s^2 - L_5 R_5 g_m s + L_5 s + R_5\right)}{\left(2C_1 L_1 g_m s^2 + C_1 s + 2g_m\right)\left(C_5 L_5 R_5 s^2 + L_5 s + R_5\right)}$$

10.52 INVALID-ORDER-52 $Z(s) = \left(L_1 s + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1} + R_5,\ \infty\right)$

$$H(s) = \frac{\left(C_1 L_1 s^2+1\right)\left(C_5 L_5 R_5 g_m s^2 - C_5 L_5 s^2 + L_5 g_m s + R_5 g_m - 1\right)}{\left(C_5 L_5 s^2+1\right)\left(2C_1 L_1 g_m s^2 + C_1 s + 2g_m\right)}$$

10.53 INVALID-ORDER-53 $Z(s) = \left(L_1 s + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{\left(C_1 L_1 s^2+1\right)\left(-C_5 L_5 R_5 g_m s^2 + C_5 L_5 s^2 + C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_5 L_5 s^2 + C_5 R_5 s + 1\right)\left(2C_1 L_1 g_m s^2 + C_1 s + 2g_m\right)}$$

10.54 INVALID-ORDER-54 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1},\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{L_1 s\left(C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_5 R_5 s+1\right)\left(C_1 L_1 s^2 + 2L_1 g_m s + 1\right)}$$

10.55 INVALID-ORDER-55 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = -\frac{L_1 s\left(C_5 L_5 s^2 - L_5 g_m s + 1\right)}{\left(C_5 L_5 s^2+1\right)\left(C_1 L_1 s^2 + 2L_1 g_m s + 1\right)}$$

10.56 INVALID-ORDER-56 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1},\ \infty,\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty\right)$

$$H(s) = -\frac{L_1 s\left(C_5 L_5 R_5 s^2 - L_5 R_5 g_m s + L_5 s + R_5\right)}{\left(C_1 L_1 s^2 + 2L_1 g_m s + 1\right)\left(C_5 L_5 R_5 s^2 + L_5 s + R_5\right)}$$

10.57 INVALID-ORDER-57 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1} + R_5,\ \infty\right)$

$$H(s) = \frac{L_1 s\left(C_5 L_5 R_5 g_m s^2 - C_5 L_5 s^2 + L_5 g_m s + R_5 g_m - 1\right)}{\left(C_5 L_5 s^2+1\right)\left(C_1 L_1 s^2 + 2L_1 g_m s + 1\right)}$$

10.58 INVALID-ORDER-58 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1},\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{L_1 s\left(-C_5 L_5 R_5 g_m s^2 + C_5 L_5 s^2 + C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_1 L_1 s^2 + 2 L_1 g_m s + 1\right)\left(C_5 L_5 s^2 + C_5 R_5 s + 1\right)}$$

10.59 INVALID-ORDER-59 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = -\frac{\left(C_5 s - g_m\right)\left(C_1 L_1 s^2 + C_1 R_1 s + 1\right)}{C_5 s\left(2 C_1 L_1 g_m s^2 + 2 C_1 R_1 g_m s + C_1 s + 2 g_m\right)}$$

10.60 INVALID-ORDER-60 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{\left(C_1 L_1 s^2 + C_1 R_1 s + 1\right)\left(C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_5 R_5 s + 1\right)\left(2 C_1 L_1 g_m s^2 + 2 C_1 R_1 g_m s + C_1 s + 2 g_m\right)}$$

10.61 INVALID-ORDER-61 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{\left(C_1 L_1 s^2 + C_1 R_1 s + 1\right)\left(C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s\left(2 C_1 L_1 g_m s^2 + 2 C_1 R_1 g_m s + C_1 s + 2 g_m\right)}$$

10.62 INVALID-ORDER-62 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{\left(C_1 L_1 s^2 + C_1 R_1 s + 1\right)\left(C_5 L_5 g_m s^2 - C_5 s + g_m\right)}{C_5 s\left(2 C_1 L_1 g_m s^2 + 2 C_1 R_1 g_m s + C_1 s + 2 g_m\right)}$$

10.63 INVALID-ORDER-63 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = -\frac{\left(C_1 L_1 s^2 + C_1 R_1 s + 1\right)\left(C_5 L_5 s^2 - L_5 g_m s + 1\right)}{\left(C_5 L_5 s^2 + 1\right)\left(2 C_1 L_1 g_m s^2 + 2 C_1 R_1 g_m s + C_1 s + 2 g_m\right)}$$

10.64 INVALID-ORDER-64 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{\left(C_1 L_1 s^2 + C_1 R_1 s + 1\right)\left(C_5 L_5 g_m s^2 + C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s\left(2 C_1 L_1 g_m s^2 + 2 C_1 R_1 g_m s + C_1 s + 2 g_m\right)}$$

10.65 INVALID-ORDER-65 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty\right)$

$$H(s) = -\frac{\left(C_1 L_1 s^2 + C_1 R_1 s + 1\right)\left(C_5 L_5 R_5 s^2 - L_5 R_5 g_m s + L_5 s + R_5\right)}{\left(C_5 L_5 R_5 s^2 + L_5 s + R_5\right)\left(2 C_1 L_1 g_m s^2 + 2 C_1 R_1 g_m s + C_1 s + 2 g_m\right)}$$

10.66 INVALID-ORDER-66 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1} + R_5,\ \infty\right)$

$$H(s) = \frac{\left(C_1 L_1 s^2 + C_1 R_1 s + 1\right)\left(C_5 L_5 R_5 g_m s^2 - C_5 L_5 s^2 + L_5 g_m s + R_5 g_m - 1\right)}{\left(C_5 L_5 s^2 + 1\right)\left(2 C_1 L_1 g_m s^2 + 2 C_1 R_1 g_m s + C_1 s + 2 g_m\right)}$$

10.67 INVALID-ORDER-67 $Z(s) = \left(L_1 s + R_1 + \frac{1}{C_1 s},\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty \right)$

$$H(s) = -\frac{\left(C_1 L_1 s^2 + C_1 R_1 s + 1\right)\left(-C_5 L_5 R_5 g_m s^2 + C_5 L_5 s^2 + C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_5 L_5 s^2 + C_5 R_5 s + 1\right)\left(2C_1 L_1 g_m s^2 + 2C_1 R_1 g_m s + C_1 s + 2g_m\right)}$$

10.68 INVALID-ORDER-68 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2+L_1 s+R_1},\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1},\ \infty \right)$

$$H(s) = -\frac{L_1 R_1 s\left(C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_5 R_5 s + 1\right)\left(C_1 L_1 R_1 s^2 + 2L_1 R_1 g_m s + L_1 s + R_1\right)}$$

10.69 INVALID-ORDER-69 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2+L_1 s+R_1},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty \right)$

$$H(s) = -\frac{L_1 R_1 s\left(C_5 L_5 s^2 - L_5 g_m s + 1\right)}{\left(C_5 L_5 s^2 + 1\right)\left(C_1 L_1 R_1 s^2 + 2L_1 R_1 g_m s + L_1 s + R_1\right)}$$

10.70 INVALID-ORDER-70 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2+L_1 s+R_1},\ \infty,\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty \right)$

$$H(s) = -\frac{L_1 R_1 s\left(C_5 L_5 R_5 s^2 - L_5 R_5 g_m s + L_5 s + R_5\right)}{\left(C_5 L_5 R_5 s^2 + L_5 s + R_5\right)\left(C_1 L_1 R_1 s^2 + 2L_1 R_1 g_m s + L_1 s + R_1\right)}$$

10.71 INVALID-ORDER-71 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2+L_1 s+R_1},\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1} + R_5,\ \infty \right)$

$$H(s) = \frac{L_1 R_1 s\left(C_5 L_5 R_5 g_m s^2 - C_5 L_5 s^2 + L_5 g_m s + R_5 g_m - 1\right)}{\left(C_5 L_5 s^2 + 1\right)\left(C_1 L_1 R_1 s^2 + 2L_1 R_1 g_m s + L_1 s + R_1\right)}$$

10.72 INVALID-ORDER-72 $Z(s) = \left(\frac{L_1 R_1 s}{C_1 L_1 R_1 s^2+L_1 s+R_1},\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty \right)$

$$H(s) = -\frac{L_1 R_1 s\left(-C_5 L_5 R_5 g_m s^2 + C_5 L_5 s^2 + C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_5 L_5 s^2 + C_5 R_5 s + 1\right)\left(C_1 L_1 R_1 s^2 + 2L_1 R_1 g_m s + L_1 s + R_1\right)}$$

10.73 INVALID-ORDER-73 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1} + R_1,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \infty \right)$

$$H(s) = -\frac{\left(C_5 s - g_m\right)\left(C_1 L_1 R_1 s^2 + L_1 s + R_1\right)}{C_5 s\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + 2L_1 g_m s + 2R_1 g_m + 1\right)}$$

10.74 INVALID-ORDER-74 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1} + R_1,\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1},\ \infty \right)$

$$H(s) = -\frac{\left(C_5 R_5 s - R_5 g_m + 1\right)\left(C_1 L_1 R_1 s^2 + L_1 s + R_1\right)}{\left(C_5 R_5 s + 1\right)\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + 2L_1 g_m s + 2R_1 g_m + 1\right)}$$

10.75 INVALID-ORDER-75 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1} + R_1,\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \infty \right)$

$$H(s) = \frac{\left(C_1 L_1 R_1 s^2 + L_1 s + R_1\right)\left(C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + 2L_1 g_m s + 2R_1 g_m + 1\right)}$$

10.76 INVALID-ORDER-76 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1} + R_1,\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{\left(C_1 L_1 R_1 s^2 + L_1 s + R_1\right)\left(C_5 L_5 g_m s^2 - C_5 s + g_m\right)}{C_5 s\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + 2L_1 g_m s + 2R_1 g_m + 1\right)}$$

10.77 INVALID-ORDER-77 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1} + R_1,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = -\frac{\left(C_5 L_5 s^2 - L_5 g_m s + 1\right)\left(C_1 L_1 R_1 s^2 + L_1 s + R_1\right)}{\left(C_5 L_5 s^2 + 1\right)\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + 2L_1 g_m s + 2R_1 g_m + 1\right)}$$

10.78 INVALID-ORDER-78 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1} + R_1,\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{\left(C_1 L_1 R_1 s^2 + L_1 s + R_1\right)\left(C_5 L_5 g_m s^2 + C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + 2L_1 g_m s + 2R_1 g_m + 1\right)}$$

10.79 INVALID-ORDER-79 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1} + R_1,\ \infty,\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty\right)$

$$H(s) = -\frac{\left(C_1 L_1 R_1 s^2 + L_1 s + R_1\right)\left(C_5 L_5 R_5 s^2 - L_5 R_5 g_m s + L_5 s + R_5\right)}{\left(C_5 L_5 R_5 s^2 + L_5 s + R_5\right)\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + 2L_1 g_m s + 2R_1 g_m + 1\right)}$$

10.80 INVALID-ORDER-80 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1} + R_1,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1} + R_5,\ \infty\right)$

$$H(s) = \frac{\left(C_1 L_1 R_1 s^2 + L_1 s + R_1\right)\left(C_5 L_5 R_5 g_m s^2 - C_5 L_5 s^2 + L_5 g_m s + R_5 g_m - 1\right)}{\left(C_5 L_5 s^2 + 1\right)\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + 2L_1 g_m s + 2R_1 g_m + 1\right)}$$

10.81 INVALID-ORDER-81 $Z(s) = \left(\frac{L_1 s}{C_1 L_1 s^2+1} + R_1,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{\left(C_1 L_1 R_1 s^2 + L_1 s + R_1\right)\left(-C_5 L_5 R_5 g_m s^2 + C_5 L_5 s^2 + C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_5 L_5 s^2 + C_5 R_5 s + 1\right)\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + 2L_1 g_m s + 2R_1 g_m + 1\right)}$$

10.82 INVALID-ORDER-82 $Z(s) = \left(\frac{R_1\left(C_1 L_1 s^2+1\right)}{C_1 L_1 s^2+C_1 R_1 s+1},\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = -\frac{R_1\left(C_5 s - g_m\right)\left(C_1 L_1 s^2 + 1\right)}{C_5 s\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + C_1 R_1 s + 2R_1 g_m + 1\right)}$$

10.83 INVALID-ORDER-83 $Z(s) = \left(\frac{R_1\left(C_1 L_1 s^2+1\right)}{C_1 L_1 s^2+C_1 R_1 s+1},\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = -\frac{R_1\left(C_1 L_1 s^2 + 1\right)\left(C_5 R_5 s - R_5 g_m + 1\right)}{\left(C_5 R_5 s + 1\right)\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + C_1 R_1 s + 2R_1 g_m + 1\right)}$$

10.84 INVALID-ORDER-84 $Z(s) = \left(\frac{R_1\left(C_1 L_1 s^2+1\right)}{C_1 L_1 s^2+C_1 R_1 s+1},\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{R_1\left(C_1 L_1 s^2 + 1\right)\left(C_5 R_5 g_m s - C_5 s + g_m\right)}{C_5 s\left(2C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + C_1 R_1 s + 2R_1 g_m + 1\right)}$$

10.85 INVALID-ORDER-85 $Z(s) = \left(\frac{R_1\left(C_1L_1s^2+1\right)}{C_1L_1s^2+C_1R_1s+1},\ \infty,\ \infty,\ \infty,\ L_5s+\frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{R_1\left(C_1L_1s^2+1\right)\left(C_5L_5g_ms^2-C_5s+g_m\right)}{C_5s\left(2C_1L_1R_1g_ms^2+C_1L_1s^2+C_1R_1s+2R_1g_m+1\right)}$$

10.86 INVALID-ORDER-86 $Z(s) = \left(\frac{R_1\left(C_1L_1s^2+1\right)}{C_1L_1s^2+C_1R_1s+1},\ \infty,\ \infty,\ \infty,\ \frac{L_5s}{C_5L_5s^2+1},\ \infty\right)$

$$H(s) = -\frac{R_1\left(C_1L_1s^2+1\right)\left(C_5L_5s^2-L_5g_ms+1\right)}{\left(C_5L_5s^2+1\right)\left(2C_1L_1R_1g_ms^2+C_1L_1s^2+C_1R_1s+2R_1g_m+1\right)}$$

10.87 INVALID-ORDER-87 $Z(s) = \left(\frac{R_1\left(C_1L_1s^2+1\right)}{C_1L_1s^2+C_1R_1s+1},\ \infty,\ \infty,\ \infty,\ L_5s+R_5+\frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{R_1\left(C_1L_1s^2+1\right)\left(C_5L_5g_ms^2+C_5R_5g_ms-C_5s+g_m\right)}{C_5s\left(2C_1L_1R_1g_ms^2+C_1L_1s^2+C_1R_1s+2R_1g_m+1\right)}$$

10.88 INVALID-ORDER-88 $Z(s) = \left(\frac{R_1\left(C_1L_1s^2+1\right)}{C_1L_1s^2+C_1R_1s+1},\ \infty,\ \infty,\ \infty,\ \frac{L_5R_5s}{C_5L_5R_5s^2+L_5s+R_5},\ \infty\right)$

$$H(s) = -\frac{R_1\left(C_1L_1s^2+1\right)\left(C_5L_5R_5s^2-L_5R_5g_ms+L_5s+R_5\right)}{\left(C_5L_5R_5s^2+L_5s+R_5\right)\left(2C_1L_1R_1g_ms^2+C_1L_1s^2+C_1R_1s+2R_1g_m+1\right)}$$

10.89 INVALID-ORDER-89 $Z(s) = \left(\frac{R_1\left(C_1L_1s^2+1\right)}{C_1L_1s^2+C_1R_1s+1},\ \infty,\ \infty,\ \infty,\ \frac{L_5s}{C_5L_5s^2+1}+R_5,\ \infty\right)$

$$H(s) = \frac{R_1\left(C_1L_1s^2+1\right)\left(C_5L_5R_5g_ms^2-C_5L_5s^2+L_5g_ms+R_5g_m-1\right)}{\left(C_5L_5s^2+1\right)\left(2C_1L_1R_1g_ms^2+C_1L_1s^2+C_1R_1s+2R_1g_m+1\right)}$$

10.90 INVALID-ORDER-90 $Z(s) = \left(\frac{R_1\left(C_1L_1s^2+1\right)}{C_1L_1s^2+C_1R_1s+1},\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1},\ \infty\right)$

$$H(s) = -\frac{R_1\left(C_1L_1s^2+1\right)\left(-C_5L_5R_5g_ms^2+C_5L_5s^2+C_5R_5s-R_5g_m+1\right)}{\left(C_5L_5s^2+C_5R_5s+1\right)\left(2C_1L_1R_1g_ms^2+C_1L_1s^2+C_1R_1s+2R_1g_m+1\right)}$$

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