Filter Summary Report: CG,TIA,simple,Z4,Z5

Generated by MacAnalog-Symbolix

January 17, 2025

Contents

1 Examined $H(z)$ for CG TIA simple Z4 Z5: $\frac{Z_4 Z_5 g_m - Z_4}{2Z_4 g_m + 2Z_5 g_m + 2}$

$$H(z) = \frac{Z_4 Z_5 g_m - Z_4}{2Z_4 g_m + 2Z_5 g_m + 2}$$

2 HP

3 BP

3.1 BP-1 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 s}{C_4 L_4 s^2 + 1},\ R_5,\ \infty\right)$

$$H(s) = \frac{s\left(L_4 R_5 g_m - L_4\right)}{2L_4 g_m s + 2R_5 g_m + s^2\left(2C_4 L_4 R_5 g_m + 2C_4 L_4\right) + 2}$$

Parameters:

Q: $\frac{C_4 R_5 g_m \sqrt{\frac{1}{C_4 L_4}} + C_4 \sqrt{\frac{1}{C_4 L_4}}}{g_m}$
wo: $\sqrt{\frac{1}{C_4 L_4}}$
bandwidth: $\frac{g_m \sqrt{\frac{1}{C_4 L_4}}}{C_4 R_5 g_m \sqrt{\frac{1}{C_4 L_4}} + C_4 \sqrt{\frac{1}{C_4 L_4}}}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_5 g_m - 1}{2 g_m}$
Qz: None
Wz: None

3.2 BP-2 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2 + L_4 s + R_4},\ R_5,\ \infty\right)$

$$H(s) = \frac{s\left(L_4 R_4 R_5 g_m - L_4 R_4\right)}{2R_4 R_5 g_m + 2R_4 + s^2\left(2C_4 L_4 R_4 R_5 g_m + 2C_4 L_4 R_4\right) + s\left(2L_4 R_4 g_m + 2L_4 R_5 g_m + 2L_4\right)}$$

Parameters:

Q: $\frac{C_4 R_4 R_5 g_m \sqrt{\frac{1}{C_4 L_4}} + C_4 R_4 \sqrt{\frac{1}{C_4 L_4}}}{R_4 g_m + R_5 g_m + 1}$
wo: $\sqrt{\frac{1}{C_4 L_4}}$
bandwidth: $\frac{\sqrt{\frac{1}{C_4 L_4}}\left(R_4 g_m + R_5 g_m + 1\right)}{C_4 R_4 R_5 g_m \sqrt{\frac{1}{C_4 L_4}} + C_4 R_4 \sqrt{\frac{1}{C_4 L_4}}}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_4 R_5 g_m - R_4}{2R_4 g_m + 2R_5 g_m + 2}$
Qz: None
Wz: None

4 LP

5 BS

5.1 BS-1 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + \frac{1}{C_4 s},\ R_5,\ \infty\right)$

$$H(s) = \frac{R_5 g_m + s^2 \left(C_4 L_4 R_5 g_m - C_4 L_4\right) - 1}{2 C_4 L_4 g_m s^2 + 2 g_m + s \left(2 C_4 R_5 g_m + 2 C_4\right)}$$

Parameters:

Q: $\frac{L_4 g_m \sqrt{\frac{1}{C_4 L_4}}}{R_5 g_m + 1}$
wo: $\sqrt{\frac{1}{C_4 L_4}}$
bandwidth: $\frac{R_5 g_m + 1}{L_4 g_m}$
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: $\sqrt{\frac{1}{C_4 L_4}}$

5.2 BS-2 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4\left(C_4 L_4 s^2 + 1\right)}{C_4 L_4 s^2 + C_4 R_4 s + 1},\ R_5,\ \infty\right)$

$$H(s) = \frac{R_4 R_5 g_m - R_4 + s^2 \left(C_4 L_4 R_4 R_5 g_m - C_4 L_4 R_4\right)}{2 R_4 g_m + 2 R_5 g_m + s^2 \left(2 C_4 L_4 R_4 g_m + 2 C_4 L_4 R_5 g_m + 2 C_4 L_4\right) + s \left(2 C_4 R_4 R_5 g_m + 2 C_4 R_4\right) + 2}$$

Parameters:

Q: $\frac{L_4 R_4 g_m \sqrt{\frac{1}{C_4 L_4}} + L_4 R_5 g_m \sqrt{\frac{1}{C_4 L_4}} + L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_4 R_5 g_m + R_4}$
wo: $\sqrt{\frac{1}{C_4 L_4}}$
bandwidth: $\frac{\sqrt{\frac{1}{C_4 L_4}} \left(R_4 R_5 g_m + R_4\right)}{L_4 R_4 g_m \sqrt{\frac{1}{C_4 L_4}} + L_4 R_5 g_m \sqrt{\frac{1}{C_4 L_4}} + L_4 \sqrt{\frac{1}{C_4 L_4}}}$
K-LP: $\frac{R_4 R_5 g_m - R_4}{2 R_4 g_m + 2 R_5 g_m + 2}$
K-HP: $\frac{R_4 R_5 g_m - R_4}{2 R_4 g_m + 2 R_5 g_m + 2}$
K-BP: 0
Qz: None
Wz: $\sqrt{\frac{1}{C_4 L_4}}$

6 GE

6.1 GE-1 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4,\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_5 R_4 g_m s^2 - C_5 R_4 s + R_4 g_m}{2 C_5 L_5 g_m s^2 + 2 g_m + s \left(2 C_5 R_4 g_m + 2 C_5\right)}$$

Parameters:

Q: $\frac{L_5 g_m \sqrt{\frac{1}{C_5 L_5}}}{R_4 g_m + 1}$
wo: $\sqrt{\frac{1}{C_5 L_5}}$
bandwidth: $\frac{R_4 g_m + 1}{L_5 g_m}$
K-LP: $\frac{R_4}{2}$
K-HP: $\frac{R_4}{2}$
K-BP: $-\frac{R_4}{2 R_4 g_m + 2}$
Qz: $-L_5 g_m \sqrt{\frac{1}{C_5 L_5}}$
Wz: $\sqrt{\frac{1}{C_5 L_5}}$

6.2 GE-2 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4,\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = \frac{-C_5 L_5 R_4 s^2 + L_5 R_4 g_m s - R_4}{2L_5 g_m s + 2R_4 g_m + s^2\left(2C_5 L_5 R_4 g_m + 2C_5 L_5\right) + 2}$$

Parameters:

Q: $\frac{C_5 R_4 g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 \sqrt{\frac{1}{C_5 L_5}}}{g_m}$

wo: $\sqrt{\frac{1}{C_5 L_5}}$

bandwidth: $\frac{g_m \sqrt{\frac{1}{C_5 L_5}}}{C_5 R_4 g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 \sqrt{\frac{1}{C_5 L_5}}}$

K-LP: $-\frac{R_4}{2R_4 g_m + 2}$

K-HP: $-\frac{R_4}{2R_4 g_m + 2}$

K-BP: $\frac{R_4}{2}$

Qz: $-\frac{C_5 \sqrt{\frac{1}{C_5 L_5}}}{g_m}$

Wz: $\sqrt{\frac{1}{C_5 L_5}}$

6.3 GE-3 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_5 R_4 g_m s^2 + R_4 g_m + s\left(C_5 R_4 R_5 g_m - C_5 R_4\right)}{2C_5 L_5 g_m s^2 + 2g_m + s\left(2C_5 R_4 g_m + 2C_5 R_5 g_m + 2C_5\right)}$$

Parameters:

Q: $\frac{L_5 g_m \sqrt{\frac{1}{C_5 L_5}}}{R_4 g_m + R_5 g_m + 1}$

wo: $\sqrt{\frac{1}{C_5 L_5}}$

bandwidth: $\frac{R_4 g_m + R_5 g_m + 1}{L_5 g_m}$

K-LP: $\frac{R_4}{2}$

K-HP: $\frac{R_4}{2}$

K-BP: $\frac{R_4 R_5 g_m - R_4}{2R_4 g_m + 2R_5 g_m + 2}$

Qz: $\frac{L_5 g_m \sqrt{\frac{1}{C_5 L_5}}}{R_5 g_m - 1}$

Wz: $\sqrt{\frac{1}{C_5 L_5}}$

6.4 GE-4 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5},\ \infty\right)$

$$H(s) = \frac{-C_5 L_5 R_4 R_5 s^2 - R_4 R_5 + s\left(L_5 R_4 R_5 g_m - L_5 R_4\right)}{2R_4 R_5 g_m + 2R_5 + s^2\left(2C_5 L_5 R_4 R_5 g_m + 2C_5 L_5 R_5\right) + s\left(2L_5 R_4 g_m + 2L_5 R_5 g_m + 2L_5\right)}$$

Parameters:

Q: $\frac{C_5 R_4 R_5 g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_5 \sqrt{\frac{1}{C_5 L_5}}}{R_4 g_m + R_5 g_m + 1}$

wo: $\sqrt{\frac{1}{C_5 L_5}}$

bandwidth: $\frac{\sqrt{\frac{1}{C_5 L_5}}\left(R_4 g_m + R_5 g_m + 1\right)}{C_5 R_4 R_5 g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_5 \sqrt{\frac{1}{C_5 L_5}}}$

K-LP: $-\frac{R_4}{2R_4 g_m + 2}$

K-HP: $-\frac{R_4}{2R_4 g_m + 2}$

K-BP: $\frac{R_4 R_5 g_m - R_4}{2R_4 g_m + 2R_5 g_m + 2}$

Qz: $-\frac{C_5 R_5 \sqrt{\frac{1}{C_5 L_5}}}{R_5 g_m - 1}$

Wz: $\sqrt{\frac{1}{C_5 L_5}}$

6.5 GE-5 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4,\ \frac{C_5L_5R_5s^2+L_5s+R_5}{C_5L_5s^2+1},\ \infty\right)$

$$H(s) = \frac{L_5R_4g_ms + R_4R_5g_m - R_4 + s^2\left(C_5L_5R_4R_5g_m - C_5L_5R_4\right)}{2L_5g_ms + 2R_4g_m + 2R_5g_m + s^2\left(2C_5L_5R_4g_m + 2C_5L_5R_5g_m + 2C_5L_5\right) + 2}$$

Parameters:

Q: $\frac{C_5R_4g_m\sqrt{\frac{1}{C_5L_5}}+C_5R_5g_m\sqrt{\frac{1}{C_5L_5}}+C_5\sqrt{\frac{1}{C_5L_5}}}{g_m}$

wo: $\sqrt{\frac{1}{C_5L_5}}$

bandwidth: $\frac{g_m\sqrt{\frac{1}{C_5L_5}}}{C_5R_4g_m\sqrt{\frac{1}{C_5L_5}}+C_5R_5g_m\sqrt{\frac{1}{C_5L_5}}+C_5\sqrt{\frac{1}{C_5L_5}}}$

K-LP: $\frac{R_4R_5g_m-R_4}{2R_4g_m+2R_5g_m+2}$

K-HP: $\frac{R_4R_5g_m-R_4}{2R_4g_m+2R_5g_m+2}$

K-BP: $\frac{R_4}{2}$

Qz: $\frac{C_5R_5g_m\sqrt{\frac{1}{C_5L_5}}-C_5\sqrt{\frac{1}{C_5L_5}}}{g_m}$

Wz: $\sqrt{\frac{1}{C_5L_5}}$

6.6 GE-6 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1},\ \infty\right)$

$$H(s) = \frac{-C_5R_4R_5s + R_4R_5g_m - R_4 + s^2\left(C_5L_5R_4R_5g_m - C_5L_5R_4\right)}{2R_4g_m + 2R_5g_m + s^2\left(2C_5L_5R_4g_m + 2C_5L_5R_5g_m + 2C_5L_5\right) + s\left(2C_5R_4R_5g_m + 2C_5R_5\right) + 2}$$

Parameters:

Q: $\frac{L_5R_4g_m\sqrt{\frac{1}{C_5L_5}}+L_5R_5g_m\sqrt{\frac{1}{C_5L_5}}+L_5\sqrt{\frac{1}{C_5L_5}}}{R_4R_5g_m+R_5}$

wo: $\sqrt{\frac{1}{C_5L_5}}$

bandwidth: $\frac{\sqrt{\frac{1}{C_5L_5}}(R_4R_5g_m+R_5)}{L_5R_4g_m\sqrt{\frac{1}{C_5L_5}}+L_5R_5g_m\sqrt{\frac{1}{C_5L_5}}+L_5\sqrt{\frac{1}{C_5L_5}}}$

K-LP: $\frac{R_4R_5g_m-R_4}{2R_4g_m+2R_5g_m+2}$

K-HP: $\frac{R_4R_5g_m-R_4}{2R_4g_m+2R_5g_m+2}$

K-BP: $-\frac{R_4}{2R_4g_m+2}$

Qz: $\frac{-L_5R_5g_m\sqrt{\frac{1}{C_5L_5}}+L_5\sqrt{\frac{1}{C_5L_5}}}{R_5}$

Wz: $\sqrt{\frac{1}{C_5L_5}}$

6.7 GE-7 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4s + R_4 + \frac{1}{C_4s},\ R_5,\ \infty\right)$

$$H(s) = \frac{R_5g_m + s^2\left(C_4L_4R_5g_m - C_4L_4\right) + s\left(C_4R_4R_5g_m - C_4R_4\right) - 1}{2C_4L_4g_ms^2 + 2g_m + s\left(2C_4R_4g_m + 2C_4R_5g_m + 2C_4\right)}$$

Parameters:

Q: $\frac{L_4g_m\sqrt{\frac{1}{C_4L_4}}}{R_4g_m+R_5g_m+1}$

wo: $\sqrt{\frac{1}{C_4L_4}}$

bandwidth: $\frac{R_4g_m+R_5g_m+1}{L_4g_m}$

K-LP: $\frac{R_5g_m-1}{2g_m}$

K-HP: $\frac{R_5g_m-1}{2g_m}$

K-BP: $\frac{R_4R_5g_m-R_4}{2R_4g_m+2R_5g_m+2}$

Qz: $\frac{L_4\sqrt{\frac{1}{C_4L_4}}}{R_4}$

Wz: $\sqrt{\frac{1}{C_4L_4}}$

6.8 GE-8 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{C_4L_4R_4s^2+L_4s+R_4}{C_4L_4s^2+1},\ R_5,\ \infty\right)$

$$H(s) = \frac{R_4R_5g_m - R_4 + s^2\left(C_4L_4R_4R_5g_m - C_4L_4R_4\right) + s\left(L_4R_5g_m - L_4\right)}{2L_4g_ms + 2R_4g_m + 2R_5g_m + s^2\left(2C_4L_4R_4g_m + 2C_4L_4R_5g_m + 2C_4L_4\right) + 2}$$

Parameters:

Q: $\frac{C_4R_4g_m\sqrt{\frac{1}{C_4L_4}}+C_4R_5g_m\sqrt{\frac{1}{C_4L_4}}+C_4\sqrt{\frac{1}{C_4L_4}}}{g_m}$
wo: $\sqrt{\frac{1}{C_4L_4}}$
bandwidth: $\frac{g_m\sqrt{\frac{1}{C_4L_4}}}{C_4R_4g_m\sqrt{\frac{1}{C_4L_4}}+C_4R_5g_m\sqrt{\frac{1}{C_4L_4}}+C_4\sqrt{\frac{1}{C_4L_4}}}$
K-LP: $\frac{R_4R_5g_m-R_4}{2R_4g_m+2R_5g_m+2}$
K-HP: $\frac{R_4R_5g_m-R_4}{2R_4g_m+2R_5g_m+2}$
K-BP: $\frac{R_5g_m-1}{2g_m}$
Qz: $C_4R_4\sqrt{\frac{1}{C_4L_4}}$
Wz: $\sqrt{\frac{1}{C_4L_4}}$

7 AP

8 INVALID-NUMER

8.1 INVALID-NUMER-1 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{1}{C_4s},\ \frac{R_5}{C_5R_5s+1},\ \infty\right)$

$$H(s) = \frac{-C_5R_5s + R_5g_m - 1}{2C_4C_5R_5s^2 + 2g_m + s\left(2C_4R_5g_m + 2C_4 + 2C_5R_5g_m\right)}$$

Parameters:

Q: $\frac{C_4C_5R_5\sqrt{\frac{g_m}{C_4C_5R_5}}}{C_4R_5g_m+C_4+C_5R_5g_m}$
wo: $\sqrt{\frac{g_m}{C_4C_5R_5}}$
bandwidth: $\frac{C_4R_5g_m+C_4+C_5R_5g_m}{C_4C_5R_5}$
K-LP: $\frac{R_5g_m-1}{2g_m}$
K-HP: 0
K-BP: $-\frac{C_5R_5}{2C_4R_5g_m+2C_4+2C_5R_5g_m}$
Qz: None
Wz: None

8.2 INVALID-NUMER-2 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4}{C_4R_4s+1},\ \frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{-C_5R_4s + R_4g_m}{2C_4C_5R_4s^2 + 2g_m + s\left(2C_4R_4g_m + 2C_5R_4g_m + 2C_5\right)}$$

Parameters:

Q: $\frac{C_4C_5R_4\sqrt{\frac{g_m}{C_4C_5R_4}}}{C_4R_4g_m+C_5R_4g_m+C_5}$
wo: $\sqrt{\frac{g_m}{C_4C_5R_4}}$
bandwidth: $\frac{C_4R_4g_m+C_5R_4g_m+C_5}{C_4C_5R_4}$
K-LP: $\frac{R_4}{2}$
K-HP: 0
K-BP: $-\frac{C_5R_4}{2C_4R_4g_m+2C_5R_4g_m+2C_5}$
Qz: None
Wz: None

8.3 INVALID-NUMER-3 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4}{C_4R_4s+1},\ \frac{R_5}{C_5R_5s+1},\ \infty\right)$

$$H(s) = \frac{-C_5R_4R_5s + R_4R_5g_m - R_4}{2C_4C_5R_4R_5s^2 + 2R_4g_m + 2R_5g_m + s\left(2C_4R_4R_5g_m + 2C_4R_4 + 2C_5R_4R_5g_m + 2C_5R_5\right) + 2}$$

Parameters:

Q: $\frac{C_4C_5R_4R_5\sqrt{\frac{g_m}{C_4C_5R_5}+\frac{g_m}{C_4C_5R_4}+\frac{1}{C_4C_5R_4R_5}}}{C_4R_4R_5g_m+C_4R_4+C_5R_4R_5g_m+C_5R_5}$
wo: $\sqrt{\frac{R_4g_m+R_5g_m+1}{C_4C_5R_4R_5}}$
bandwidth: $\frac{\sqrt{\frac{R_4g_m+R_5g_m+1}{C_4C_5R_4R_5}}(C_4R_4R_5g_m+C_4R_4+C_5R_4R_5g_m+C_5R_5)}{C_4C_5R_4R_5\sqrt{\frac{g_m}{C_4C_5R_5}+\frac{g_m}{C_4C_5R_4}+\frac{1}{C_4C_5R_4R_5}}}$
K-LP: $\frac{R_4R_5g_m-R_4}{2R_4g_m+2R_5g_m+2}$
K-HP: 0
K-BP: $-\frac{C_5R_4R_5}{2C_4R_4R_5g_m+2C_4R_4+2C_5R_4R_5g_m+2C_5R_5}$
Qz: None
Wz: None

8.4 INVALID-NUMER-4 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4}{C_4R_4s+1},\ R_5+\frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{R_4g_m + s\left(C_5R_4R_5g_m - C_5R_4\right)}{2g_m + s^2\left(2C_4C_5R_4R_5g_m + 2C_4C_5R_4\right) + s\left(2C_4R_4g_m + 2C_5R_4g_m + 2C_5R_5g_m + 2C_5\right)}$$

Parameters:

Q: $\frac{C_4C_5R_4R_5g_m\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_4}}+C_4C_5R_4\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_4}}}{C_4R_4g_m+C_5R_4g_m+C_5R_5g_m+C_5}$
wo: $\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_4}}$
bandwidth: $\frac{\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_4}}(C_4R_4g_m+C_5R_4g_m+C_5R_5g_m+C_5)}{C_4C_5R_4R_5g_m\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_4}}+C_4C_5R_4\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_4}}}$
K-LP: $\frac{R_4}{2}$
K-HP: 0
K-BP: $\frac{C_5R_4R_5g_m-C_5R_4}{2C_4R_4g_m+2C_5R_4g_m+2C_5R_5g_m+2C_5}$
Qz: None
Wz: None

9 INVALID-WZ

9.1 INVALID-WZ-1 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4+\frac{1}{C_4s},\ \frac{R_5}{C_5R_5s+1},\ \infty\right)$

$$H(s) = \frac{-C_4C_5R_4R_5s^2 + R_5g_m + s\left(C_4R_4R_5g_m - C_4R_4 - C_5R_5\right) - 1}{2g_m + s^2\left(2C_4C_5R_4R_5g_m + 2C_4C_5R_5\right) + s\left(2C_4R_4g_m + 2C_4R_5g_m + 2C_4 + 2C_5R_5g_m\right)}$$

Parameters:

Q: $\frac{C_4C_5R_4R_5g_m\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_5}}+C_4C_5R_5\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_5}}}{C_4R_4g_m+C_4R_5g_m+C_4+C_5R_5g_m}$
wo: $\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_5}}$
bandwidth: $\frac{\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_5}}(C_4R_4g_m+C_4R_5g_m+C_4+C_5R_5g_m)}{C_4C_5R_4R_5g_m\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_5}}+C_4C_5R_5\sqrt{\frac{g_m}{C_4C_5R_4R_5g_m+C_4C_5R_5}}}$
K-LP: $\frac{R_5g_m-1}{2g_m}$
K-HP: $-\frac{R_4}{2R_4g_m+2}$
K-BP: $\frac{C_4R_4R_5g_m-C_4R_4-C_5R_5}{2C_4R_4g_m+2C_4R_5g_m+2C_4+2C_5R_5g_m}$
Qz: None
Wz: $\sqrt{\frac{-R_5g_m+1}{C_4C_5R_4R_5}}$

10 INVALID-ORDER

10.1 INVALID-ORDER-1 $Z(s) = (\infty,\ \infty,\ \infty,\ R_4,\ R_5,\ \infty)$

$$H(s) = \frac{R_4 R_5 g_m - R_4}{2R_4 g_m + 2R_5 g_m + 2}$$

10.2 INVALID-ORDER-2 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4,\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{-C_5 R_4 s + R_4 g_m}{2g_m + s\left(2C_5 R_4 g_m + 2C_5\right)}$$

10.3 INVALID-ORDER-3 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4,\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = \frac{-C_5 R_4 R_5 s + R_4 R_5 g_m - R_4}{2R_4 g_m + 2R_5 g_m + s\left(2C_5 R_4 R_5 g_m + 2C_5 R_5\right) + 2}$$

10.4 INVALID-ORDER-4 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4,\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{R_4 g_m + s\left(C_5 R_4 R_5 g_m - C_5 R_4\right)}{2g_m + s\left(2C_5 R_4 g_m + 2C_5 R_5 g_m + 2C_5\right)}$$

10.5 INVALID-ORDER-5 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{1}{C_4 s},\ R_5,\ \infty\right)$

$$H(s) = \frac{R_5 g_m - 1}{2g_m + s\left(2C_4 R_5 g_m + 2C_4\right)}$$

10.6 INVALID-ORDER-6 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{1}{C_4 s},\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{-C_5 s + g_m}{2C_4 C_5 s^2 + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.7 INVALID-ORDER-7 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{1}{C_4 s},\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{g_m + s\left(C_5 R_5 g_m - C_5\right)}{s^2\left(2C_4 C_5 R_5 g_m + 2C_4 C_5\right) + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.8 INVALID-ORDER-8 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{1}{C_4 s},\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_5 g_m s^2 - C_5 s + g_m}{2C_4 C_5 L_5 g_m s^3 + 2C_4 C_5 s^2 + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.9 INVALID-ORDER-9 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{1}{C_4 s},\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = \frac{-C_5 L_5 s^2 + L_5 g_m s - 1}{2C_4 C_5 L_5 s^3 + 2C_4 s + 2g_m + s^2\left(2C_4 L_5 g_m + 2C_5 L_5 g_m\right)}$$

10.10 INVALID-ORDER-10 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{1}{C_4 s},\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_5 g_m s^2 + g_m + s\left(C_5 R_5 g_m - C_5\right)}{2C_4 C_5 L_5 g_m s^3 + s^2\left(2C_4 C_5 R_5 g_m + 2C_4 C_5\right) + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.11 INVALID-ORDER-11 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{1}{C_4 s},\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5},\ \infty\right)$

$$H(s) = \frac{-C_5 L_5 R_5 s^2 - R_5 + s\left(L_5 R_5 g_m - L_5\right)}{2C_4 C_5 L_5 R_5 s^3 + 2R_5 g_m + s^2\left(2C_4 L_5 R_5 g_m + 2C_4 L_5 + 2C_5 L_5 R_5 g_m\right) + s\left(2C_4 R_5 + 2L_5 g_m\right)}$$

10.12 INVALID-ORDER-12 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{1}{C_4 s},\ \frac{C_5 L_5 R_5 s^2 + L_5 s + R_5}{C_5 L_5 s^2 + 1},\ \infty\right)$

$$H(s) = \frac{L_5 g_m s + R_5 g_m + s^2\left(C_5 L_5 R_5 g_m - C_5 L_5\right) - 1}{2g_m + s^3\left(2C_4 C_5 L_5 R_5 g_m + 2C_4 C_5 L_5\right) + s^2\left(2C_4 L_5 g_m + 2C_5 L_5 g_m\right) + s\left(2C_4 R_5 g_m + 2C_4\right)}$$

10.13 INVALID-ORDER-13 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{1}{C_4 s},\ \frac{R_5\left(C_5 L_5 s^2 + 1\right)}{C_5 L_5 s^2 + C_5 R_5 s + 1},\ \infty\right)$

$$H(s) = \frac{-C_5 R_5 s + R_5 g_m + s^2\left(C_5 L_5 R_5 g_m - C_5 L_5\right) - 1}{2g_m + s^3\left(2C_4 C_5 L_5 R_5 g_m + 2C_4 C_5 L_5\right) + s^2\left(2C_4 C_5 R_5 + 2C_5 L_5 g_m\right) + s\left(2C_4 R_5 g_m + 2C_4 + 2C_5 R_5 g_m\right)}$$

10.14 INVALID-ORDER-14 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4}{C_4 R_4 s + 1},\ R_5,\ \infty\right)$

$$H(s) = \frac{R_4 R_5 g_m - R_4}{2R_4 g_m + 2R_5 g_m + s\left(2C_4 R_4 R_5 g_m + 2C_4 R_4\right) + 2}$$

10.15 INVALID-ORDER-15 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4}{C_4 R_4 s + 1},\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_5 R_4 g_m s^2 - C_5 R_4 s + R_4 g_m}{2C_4 C_5 L_5 R_4 g_m s^3 + 2g_m + s^2\left(2C_4 C_5 R_4 + 2C_5 L_5 g_m\right) + s\left(2C_4 R_4 g_m + 2C_5 R_4 g_m + 2C_5\right)}$$

10.16 INVALID-ORDER-16 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4}{C_4 R_4 s + 1},\ \frac{L_5 s}{C_5 L_5 s^2 + 1},\ \infty\right)$

$$H(s) = \frac{-C_5 L_5 R_4 s^2 + L_5 R_4 g_m s - R_4}{2C_4 C_5 L_5 R_4 s^3 + 2R_4 g_m + s^2\left(2C_4 L_5 R_4 g_m + 2C_5 L_5 R_4 g_m + 2C_5 L_5\right) + s\left(2C_4 R_4 + 2L_5 g_m\right) + 2}$$

10.17 INVALID-ORDER-17 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4}{C_4 R_4 s + 1},\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_5 R_4 g_m s^2 + R_4 g_m + s\left(C_5 R_4 R_5 g_m - C_5 R_4\right)}{2C_4 C_5 L_5 R_4 g_m s^3 + 2g_m + s^2\left(2C_4 C_5 R_4 R_5 g_m + 2C_4 C_5 R_4 + 2C_5 L_5 g_m\right) + s\left(2C_4 R_4 g_m + 2C_5 R_4 g_m + 2C_5 R_5 g_m + 2C_5\right)}$$

10.18 INVALID-ORDER-18 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4}{C_4 R_4 s + 1},\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5},\ \infty\right)$

$$H(s) = \frac{-C_5 L_5 R_4 R_5 s^2 - R_4 R_5 + s\left(L_5 R_4 R_5 g_m - L_5 R_4\right)}{2C_4 C_5 L_5 R_4 R_5 s^3 + 2R_4 R_5 g_m + 2R_5 + s^2\left(2C_4 L_5 R_4 R_5 g_m + 2C_4 L_5 R_4 + 2C_5 L_5 R_4 R_5 g_m + 2C_5 L_5 R_5\right) + s\left(2C_4 R_4 R_5 + 2L_5 R_4 g_m + 2L_5 R_5 g_m + 2L_5\right)}$$

10.19 INVALID-ORDER-19 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4}{C_4 R_4 s + 1},\ \frac{C_5 L_5 R_5 s^2 + L_5 s + R_5}{C_5 L_5 s^2 + 1},\ \infty\right)$

$$H(s) = \frac{L_5 R_4 g_m s + R_4 R_5 g_m - R_4 + s^2\left(C_5 L_5 R_4 R_5 g_m - C_5 L_5 R_4\right)}{2R_4 g_m + 2R_5 g_m + s^3\left(2C_4 C_5 L_5 R_4 R_5 g_m + 2C_4 C_5 L_5 R_4\right) + s^2\left(2C_4 L_5 R_4 g_m + 2C_5 L_5 R_4 g_m + 2C_5 L_5 R_5 g_m + 2C_5 L_5\right) + s\left(2C_4 R_4 R_5 g_m + 2C_4 R_4 + 2L_5 g_m\right) + 2}$$

10.20 INVALID-ORDER-20 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4}{C_4R_4s+1},\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1},\ \infty\right)$

$$H(s) = \frac{-C_5R_4R_5s + R_4R_5g_m - R_4 + s^2\left(C_5L_5R_4R_5g_m - C_5L_5R_4\right)}{2R_4g_m + 2R_5g_m + s^3\left(2C_4C_5L_5R_4R_5g_m + 2C_4C_5L_5R_4\right) + s^2\left(2C_4C_5R_4R_5 + 2C_5L_5R_4g_m + 2C_5L_5R_5g_m + 2C_5L_5\right) + s\left(2C_4R_4R_5g_m + 2C_4R_4 + 2C_5R_4R_5g_m + 2C_5R_5\right) + 2}$$

10.21 INVALID-ORDER-21 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4 + \frac{1}{C_4s},\ R_5,\ \infty\right)$

$$H(s) = \frac{R_5g_m + s\left(C_4R_4R_5g_m - C_4R_4\right) - 1}{2g_m + s\left(2C_4R_4g_m + 2C_4R_5g_m + 2C_4\right)}$$

10.22 INVALID-ORDER-22 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4 + \frac{1}{C_4s},\ \frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{-C_4C_5R_4s^2 + g_m + s\left(C_4R_4g_m - C_5\right)}{s^2\left(2C_4C_5R_4g_m + 2C_4C_5\right) + s\left(2C_4g_m + 2C_5g_m\right)}$$

10.23 INVALID-ORDER-23 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4 + \frac{1}{C_4s},\ R_5 + \frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{g_m + s^2\left(C_4C_5R_4R_5g_m - C_4C_5R_4\right) + s\left(C_4R_4g_m + C_5R_5g_m - C_5\right)}{s^2\left(2C_4C_5R_4g_m + 2C_4C_5R_5g_m + 2C_4C_5\right) + s\left(2C_4g_m + 2C_5g_m\right)}$$

10.24 INVALID-ORDER-24 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4 + \frac{1}{C_4s},\ L_5s + \frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{C_4C_5L_5R_4g_ms^3 + g_m + s^2\left(-C_4C_5R_4 + C_5L_5g_m\right) + s\left(C_4R_4g_m - C_5\right)}{2C_4C_5L_5g_ms^3 + s^2\left(2C_4C_5R_4g_m + 2C_4C_5\right) + s\left(2C_4g_m + 2C_5g_m\right)}$$

10.25 INVALID-ORDER-25 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4 + \frac{1}{C_4s},\ \frac{L_5s}{C_5L_5s^2+1},\ \infty\right)$

$$H(s) = \frac{-C_4C_5L_5R_4s^3 + s^2\left(C_4L_5R_4g_m - C_5L_5\right) + s\left(-C_4R_4 + L_5g_m\right) - 1}{2g_m + s^3\left(2C_4C_5L_5R_4g_m + 2C_4C_5L_5\right) + s^2\left(2C_4L_5g_m + 2C_5L_5g_m\right) + s\left(2C_4R_4g_m + 2C_4\right)}$$

10.26 INVALID-ORDER-26 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4 + \frac{1}{C_4s},\ L_5s + R_5 + \frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{C_4C_5L_5R_4g_ms^3 + g_m + s^2\left(C_4C_5R_4R_5g_m - C_4C_5R_4 + C_5L_5g_m\right) + s\left(C_4R_4g_m + C_5R_5g_m - C_5\right)}{2C_4C_5L_5g_ms^3 + s^2\left(2C_4C_5R_4g_m + 2C_4C_5R_5g_m + 2C_4C_5\right) + s\left(2C_4g_m + 2C_5g_m\right)}$$

10.27 INVALID-ORDER-27 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4 + \frac{1}{C_4s},\ \frac{L_5R_5s}{C_5L_5R_5s^2+L_5s+R_5},\ \infty\right)$

$$H(s) = \frac{-C_4C_5L_5R_4R_5s^3 - R_5 + s^2\left(C_4L_5R_4R_5g_m - C_4L_5R_4 - C_5L_5R_5\right) + s\left(-C_4R_4R_5 + L_5R_5g_m - L_5\right)}{2R_5g_m + s^3\left(2C_4C_5L_5R_4R_5g_m + 2C_4C_5L_5R_5\right) + s^2\left(2C_4L_5R_4g_m + 2C_4L_5R_5g_m + 2C_4L_5 + 2C_5L_5R_5g_m\right) + s\left(2C_4R_4R_5g_m + 2C_4R_5 + 2L_5g_m\right)}$$

10.28 INVALID-ORDER-28 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4 + \frac{1}{C_4s},\ \frac{C_5L_5R_5s^2+L_5s+R_5}{C_5L_5s^2+1},\ \infty\right)$

$$H(s) = \frac{R_5g_m + s^3\left(C_4C_5L_5R_4R_5g_m - C_4C_5L_5R_4\right) + s^2\left(C_4L_5R_4g_m + C_5L_5R_5g_m - C_5L_5\right) + s\left(C_4R_4R_5g_m - C_4R_4 + L_5g_m\right) - 1}{2g_m + s^3\left(2C_4C_5L_5R_4g_m + 2C_4C_5L_5R_5g_m + 2C_4C_5L_5\right) + s^2\left(2C_4L_5g_m + 2C_5L_5g_m\right) + s\left(2C_4R_4g_m + 2C_4R_5g_m + 2C_4\right)}$$

10.29 INVALID-ORDER-29 $Z(s) = \left(\infty,\ \infty,\ \infty,\ R_4 + \frac{1}{C_4 s},\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty\right)$

$$H(s) = \frac{R_5 g_m + s^3\left(C_4 C_5 L_5 R_4 R_5 g_m - C_4 C_5 L_5 R_4\right) + s^2\left(-C_4 C_5 R_4 R_5 + C_5 L_5 R_5 g_m - C_5 L_5\right) + s\left(C_4 R_4 R_5 g_m - C_4 R_4 - C_5 R_5\right) - 1}{2g_m + s^3\left(2C_4 C_5 L_5 R_4 g_m + 2C_4 C_5 L_5 R_5 g_m + 2C_4 C_5 L_5\right) + s^2\left(2C_4 C_5 R_4 R_5 g_m + 2C_4 C_5 R_5 + 2C_5 L_5 g_m\right) + s\left(2C_4 R_4 g_m + 2C_4 R_5 g_m + 2C_4 + 2C_5 R_5 g_m\right)}$$

10.30 INVALID-ORDER-30 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + \frac{1}{C_4 s},\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 s^3 + C_4 L_4 g_m s^2 - C_5 s + g_m}{2C_4 C_5 L_4 g_m s^3 + 2C_4 C_5 s^2 + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.31 INVALID-ORDER-31 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + \frac{1}{C_4 s},\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 R_5 s^3 - C_5 R_5 s + R_5 g_m + s^2\left(C_4 L_4 R_5 g_m - C_4 L_4\right) - 1}{2C_4 C_5 L_4 R_5 g_m s^3 + 2g_m + s^2\left(2C_4 C_5 R_5 + 2C_4 L_4 g_m\right) + s\left(2C_4 R_5 g_m + 2C_4 + 2C_5 R_5 g_m\right)}$$

10.32 INVALID-ORDER-32 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + \frac{1}{C_4 s},\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_4 L_4 g_m s^2 + g_m + s^3\left(C_4 C_5 L_4 R_5 g_m - C_4 C_5 L_4\right) + s\left(C_5 R_5 g_m - C_5\right)}{2C_4 C_5 L_4 g_m s^3 + s^2\left(2C_4 C_5 R_5 g_m + 2C_4 C_5\right) + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.33 INVALID-ORDER-33 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + \frac{1}{C_4 s},\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_4 C_5 L_4 L_5 g_m s^4 - C_4 C_5 L_4 s^3 - C_5 s + g_m + s^2\left(C_4 L_4 g_m + C_5 L_5 g_m\right)}{2C_4 C_5 s^2 + s^3\left(2C_4 C_5 L_4 g_m + 2C_4 C_5 L_5 g_m\right) + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.34 INVALID-ORDER-34 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + \frac{1}{C_4 s},\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 L_5 s^4 + C_4 L_4 L_5 g_m s^3 + L_5 g_m s + s^2\left(-C_4 L_4 - C_5 L_5\right) - 1}{2C_4 C_5 L_4 L_5 g_m s^4 + 2C_4 C_5 L_5 s^3 + 2C_4 s + 2g_m + s^2\left(2C_4 L_4 g_m + 2C_4 L_5 g_m + 2C_5 L_5 g_m\right)}$$

10.35 INVALID-ORDER-35 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + \frac{1}{C_4 s},\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_4 C_5 L_4 L_5 g_m s^4 + g_m + s^3\left(C_4 C_5 L_4 R_5 g_m - C_4 C_5 L_4\right) + s^2\left(C_4 L_4 g_m + C_5 L_5 g_m\right) + s\left(C_5 R_5 g_m - C_5\right)}{s^3\left(2C_4 C_5 L_4 g_m + 2C_4 C_5 L_5 g_m\right) + s^2\left(2C_4 C_5 R_5 g_m + 2C_4 C_5\right) + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.36 INVALID-ORDER-36 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + \frac{1}{C_4 s},\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 L_5 R_5 s^4 - R_5 + s^3\left(C_4 L_4 L_5 R_5 g_m - C_4 L_4 L_5\right) + s^2\left(-C_4 L_4 R_5 - C_5 L_5 R_5\right) + s\left(L_5 R_5 g_m - L_5\right)}{2C_4 C_5 L_4 L_5 R_5 g_m s^4 + 2R_5 g_m + s^3\left(2C_4 C_5 L_5 R_5 + 2C_4 L_4 L_5 g_m\right) + s^2\left(2C_4 L_4 R_5 g_m + 2C_4 L_5 R_5 g_m + 2C_4 L_5 + 2C_5 L_5 R_5 g_m\right) + s\left(2C_4 R_5 + 2L_5 g_m\right)}$$

10.37 INVALID-ORDER-37 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + \frac{1}{C_4 s},\ \frac{C_5 L_5 R_5 s^2+L_5 s+R_5}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = \frac{C_4 L_4 L_5 g_m s^3 + L_5 g_m s + R_5 g_m + s^4\left(C_4 C_5 L_4 L_5 R_5 g_m - C_4 C_5 L_4 L_5\right) + s^2\left(C_4 L_4 R_5 g_m - C_4 L_4 + C_5 L_5 R_5 g_m - C_5 L_5\right) - 1}{2C_4 C_5 L_4 L_5 g_m s^4 + 2g_m + s^3\left(2C_4 C_5 L_5 R_5 g_m + 2C_4 C_5 L_5\right) + s^2\left(2C_4 L_4 g_m + 2C_4 L_5 g_m + 2C_5 L_5 g_m\right) + s\left(2C_4 R_5 g_m + 2C_4\right)}$$

10.38 INVALID-ORDER-38 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + \frac{1}{C_4 s},\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 R_5 s^3 - C_5 R_5 s + R_5 g_m + s^4 \left(C_4 C_5 L_4 L_5 R_5 g_m - C_4 C_5 L_4 L_5\right) + s^2 \left(C_4 L_4 R_5 g_m - C_4 L_4 + C_5 L_5 R_5 g_m - C_5 L_5\right) - 1}{2C_4 C_5 L_4 L_5 g_m s^4 + 2g_m + s^3 \left(2C_4 C_5 L_4 R_5 g_m + 2C_4 C_5 L_5 R_5 g_m + 2C_4 C_5 L_5\right) + s^2 \left(2C_4 C_5 R_5 + 2C_4 L_4 g_m + 2C_5 L_5 g_m\right) + s \left(2C_4 R_5 g_m + 2C_4 + 2C_5 R_5 g_m\right)}$$

10.39 INVALID-ORDER-39 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 s}{C_4 L_4 s^2+1},\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{-C_5 L_4 s^2 + L_4 g_m s}{2C_4 C_5 L_4 s^3 + 2C_5 s + 2g_m + s^2 \left(2C_4 L_4 g_m + 2C_5 L_4 g_m\right)}$$

10.40 INVALID-ORDER-40 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 s}{C_4 L_4 s^2+1},\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = \frac{-C_5 L_4 R_5 s^2 + s \left(L_4 R_5 g_m - L_4\right)}{2C_4 C_5 L_4 R_5 s^3 + 2R_5 g_m + s^2 \left(2C_4 L_4 R_5 g_m + 2C_4 L_4 + 2C_5 L_4 R_5 g_m\right) + s \left(2C_5 R_5 + 2L_4 g_m\right) + 2}$$

10.41 INVALID-ORDER-41 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 s}{C_4 L_4 s^2+1},\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_4 g_m s + s^2 \left(C_5 L_4 R_5 g_m - C_5 L_4\right)}{2g_m + s^3 \left(2C_4 C_5 L_4 R_5 g_m + 2C_4 C_5 L_4\right) + s^2 \left(2C_4 L_4 g_m + 2C_5 L_4 g_m\right) + s \left(2C_5 R_5 g_m + 2C_5\right)}$$

10.42 INVALID-ORDER-42 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 s}{C_4 L_4 s^2+1},\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_4 L_5 g_m s^3 - C_5 L_4 s^2 + L_4 g_m s}{2C_4 C_5 L_4 L_5 g_m s^4 + 2C_4 C_5 L_4 s^3 + 2C_5 s + 2g_m + s^2 \left(2C_4 L_4 g_m + 2C_5 L_4 g_m + 2C_5 L_5 g_m\right)}$$

10.43 INVALID-ORDER-43 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 s}{C_4 L_4 s^2+1},\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = \frac{-C_5 L_4 L_5 s^3 + L_4 L_5 g_m s^2 - L_4 s}{2C_4 C_5 L_4 L_5 s^4 + s^3 \left(2C_4 L_4 L_5 g_m + 2C_5 L_4 L_5 g_m\right) + s^2 \left(2C_4 L_4 + 2C_5 L_5\right) + s \left(2L_4 g_m + 2L_5 g_m\right) + 2}$$

10.44 INVALID-ORDER-44 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 s}{C_4 L_4 s^2+1},\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_4 L_5 g_m s^3 + L_4 g_m s + s^2 \left(C_5 L_4 R_5 g_m - C_5 L_4\right)}{2C_4 C_5 L_4 L_5 g_m s^4 + 2g_m + s^3 \left(2C_4 C_5 L_4 R_5 g_m + 2C_4 C_5 L_4\right) + s^2 \left(2C_4 L_4 g_m + 2C_5 L_4 g_m + 2C_5 L_5 g_m\right) + s \left(2C_5 R_5 g_m + 2C_5\right)}$$

10.45 INVALID-ORDER-45 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 s}{C_4 L_4 s^2+1},\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty\right)$

$$H(s) = \frac{-C_5 L_4 L_5 R_5 s^3 - L_4 R_5 s + s^2 \left(L_4 L_5 R_5 g_m - L_4 L_5\right)}{2C_4 C_5 L_4 L_5 R_5 s^4 + 2R_5 + s^3 \left(2C_4 L_4 L_5 R_5 g_m + 2C_4 L_4 L_5 + 2C_5 L_4 L_5 R_5 g_m\right) + s^2 \left(2C_4 L_4 R_5 + 2C_5 L_5 R_5 + 2L_4 L_5 g_m\right) + s \left(2L_4 R_5 g_m + 2L_5 R_5 g_m + 2L_5\right)}$$

10.46 INVALID-ORDER-46 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 s}{C_4 L_4 s^2+1},\ \frac{C_5 L_5 R_5 s^2+L_5 s+R_5}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = \frac{L_4 L_5 g_m s^2 + s^3 \left(C_5 L_4 L_5 R_5 g_m - C_5 L_4 L_5\right) + s \left(L_4 R_5 g_m - L_4\right)}{2R_5 g_m + s^4 \left(2C_4 C_5 L_4 L_5 R_5 g_m + 2C_4 C_5 L_4 L_5\right) + s^3 \left(2C_4 L_4 L_5 g_m + 2C_5 L_4 L_5 g_m\right) + s^2 \left(2C_4 L_4 R_5 g_m + 2C_4 L_4 + 2C_5 L_5 R_5 g_m + 2C_5 L_5\right) + s \left(2L_4 g_m + 2L_5 g_m\right) + 2}$$

10.47 INVALID-ORDER-47 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 s}{C_4 L_4 s^2+1},\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty\right)$

$$H(s) = \frac{-C_5 L_4 R_5 s^2 + s^3\left(C_5 L_4 L_5 R_5 g_m - C_5 L_4 L_5\right) + s\left(L_4 R_5 g_m - L_4\right)}{2R_5 g_m + s^4\left(2C_4 C_5 L_4 L_5 R_5 g_m + 2C_4 C_5 L_4 L_5\right) + s^3\left(2C_4 C_5 L_4 R_5 + 2C_5 L_4 L_5 g_m\right) + s^2\left(2C_4 L_4 R_5 g_m + 2C_4 L_4 + 2C_5 L_4 R_5 g_m + 2C_5 L_5 R_5 g_m + 2C_5 L_5\right) + s\left(2C_5 R_5 + 2L_4 g_m\right) + 2}$$

10.48 INVALID-ORDER-48 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + R_4 + \frac{1}{C_4 s},\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 s^3 + g_m + s^2\left(-C_4 C_5 R_4 + C_4 L_4 g_m\right) + s\left(C_4 R_4 g_m - C_5\right)}{2C_4 C_5 L_4 g_m s^3 + s^2\left(2C_4 C_5 R_4 g_m + 2C_4 C_5\right) + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.49 INVALID-ORDER-49 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + R_4 + \frac{1}{C_4 s},\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 R_5 s^3 + R_5 g_m + s^2\left(-C_4 C_5 R_4 R_5 + C_4 L_4 R_5 g_m - C_4 L_4\right) + s\left(C_4 R_4 R_5 g_m - C_4 R_4 - C_5 R_5\right) - 1}{2C_4 C_5 L_4 R_5 g_m s^3 + 2g_m + s^2\left(2C_4 C_5 R_4 R_5 g_m + 2C_4 C_5 R_5 + 2C_4 L_4 g_m\right) + s\left(2C_4 R_4 g_m + 2C_4 R_5 g_m + 2C_4 + 2C_5 R_5 g_m\right)}$$

10.50 INVALID-ORDER-50 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + R_4 + \frac{1}{C_4 s},\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{g_m + s^3\left(C_4 C_5 L_4 R_5 g_m - C_4 C_5 L_4\right) + s^2\left(C_4 C_5 R_4 R_5 g_m - C_4 C_5 R_4 + C_4 L_4 g_m\right) + s\left(C_4 R_4 g_m + C_5 R_5 g_m - C_5\right)}{2C_4 C_5 L_4 g_m s^3 + s^2\left(2C_4 C_5 R_4 g_m + 2C_4 C_5 R_5 g_m + 2C_4 C_5\right) + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.51 INVALID-ORDER-51 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + R_4 + \frac{1}{C_4 s},\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_4 C_5 L_4 L_5 g_m s^4 + g_m + s^3\left(-C_4 C_5 L_4 + C_4 C_5 L_5 R_4 g_m\right) + s^2\left(-C_4 C_5 R_4 + C_4 L_4 g_m + C_5 L_5 g_m\right) + s\left(C_4 R_4 g_m - C_5\right)}{s^3\left(2C_4 C_5 L_4 g_m + 2C_4 C_5 L_5 g_m\right) + s^2\left(2C_4 C_5 R_4 g_m + 2C_4 C_5\right) + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.52 INVALID-ORDER-52 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + R_4 + \frac{1}{C_4 s},\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 L_5 s^4 + s^3\left(-C_4 C_5 L_5 R_4 + C_4 L_4 L_5 g_m\right) + s^2\left(-C_4 L_4 + C_4 L_5 R_4 g_m - C_5 L_5\right) + s\left(-C_4 R_4 + L_5 g_m\right) - 1}{2C_4 C_5 L_4 L_5 g_m s^4 + 2g_m + s^3\left(2C_4 C_5 L_5 R_4 g_m + 2C_4 C_5 L_5\right) + s^2\left(2C_4 L_4 g_m + 2C_4 L_5 g_m + 2C_5 L_5 g_m\right) + s\left(2C_4 R_4 g_m + 2C_4\right)}$$

10.53 INVALID-ORDER-53 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + R_4 + \frac{1}{C_4 s},\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_4 C_5 L_4 L_5 g_m s^4 + g_m + s^3\left(C_4 C_5 L_4 R_5 g_m - C_4 C_5 L_4 + C_4 C_5 L_5 R_4 g_m\right) + s^2\left(C_4 C_5 R_4 R_5 g_m - C_4 C_5 R_4 + C_4 L_4 g_m + C_5 L_5 g_m\right) + s\left(C_4 R_4 g_m + C_5 R_5 g_m - C_5\right)}{s^3\left(2C_4 C_5 L_4 g_m + 2C_4 C_5 L_5 g_m\right) + s^2\left(2C_4 C_5 R_4 g_m + 2C_4 C_5 R_5 g_m + 2C_4 C_5\right) + s\left(2C_4 g_m + 2C_5 g_m\right)}$$

10.54 INVALID-ORDER-54 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + R_4 + \frac{1}{C_4 s},\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 L_5 R_5 s^4 - R_5 + s^3\left(-C_4 C_5 L_5 R_4 R_5 + C_4 L_4 L_5 R_5 g_m - C_4 L_4 L_5\right) + s^2\left(-C_4 L_4 R_5 + C_4 L_5 R_4 R_5 g_m - C_4 L_5 R_4 - C_5 L_5 R_5\right) + s\left(-C_4 R_4 R_5 + L_5 R_5 g_m - L_5\right)}{2C_4 C_5 L_4 L_5 R_5 g_m s^4 + 2R_5 g_m + s^3\left(2C_4 C_5 L_5 R_4 R_5 g_m + 2C_4 C_5 L_5 R_5 + 2C_4 L_4 L_5 g_m\right) + s^2\left(2C_4 L_4 R_5 g_m + 2C_4 L_5 R_4 g_m + 2C_4 L_5 R_5 g_m + 2C_4 L_5 + 2C_5 L_5 R_5 g_m\right) + s\left(2C_4 R_4 R_5 g_m + 2C_4 R_5 + 2L_5 g_m\right)}$$

10.55 INVALID-ORDER-55 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + R_4 + \frac{1}{C_4 s},\ \frac{C_5 L_5 R_5 s^2+L_5 s+R_5}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = \frac{R_5 g_m + s^4\left(C_4 C_5 L_4 L_5 R_5 g_m - C_4 C_5 L_4 L_5\right) + s^3\left(C_4 C_5 L_5 R_4 R_5 g_m - C_4 C_5 L_5 R_4 + C_4 L_4 L_5 g_m\right) + s^2\left(C_4 L_4 R_5 g_m - C_4 L_4 + C_4 L_5 R_4 g_m + C_5 L_5 R_5 g_m - C_5 L_5\right) + s\left(C_4 R_4 R_5 g_m - C_4 R_4 + L_5 g_m\right) - 1}{2C_4 C_5 L_4 L_5 g_m s^4 + 2g_m + s^3\left(2C_4 C_5 L_5 R_4 g_m + 2C_4 C_5 L_5 R_5 g_m + 2C_4 C_5 L_5\right) + s^2\left(2C_4 L_4 g_m + 2C_4 L_5 g_m + 2C_5 L_5 g_m\right) + s\left(2C_4 R_4 g_m + 2C_4 R_5 g_m + 2C_4\right)}$$

10.56 INVALID-ORDER-56 $Z(s) = \left(\infty,\ \infty,\ \infty,\ L_4 s + R_4 + \frac{1}{C_4 s},\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1},\ \infty\right)$

$$H(s) = \frac{R_5 g_m + s^4\left(C_4 C_5 L_4 L_5 R_5 g_m - C_4 C_5 L_4 L_5\right) + s^3\left(-C_4 C_5 L_4 R_5 + C_4 C_5 L_5 R_4 R_5 g_m - C_4 C_5 L_5 R_4\right) + s^2\left(-C_4 C_5 R_4 R_5 + C_4 L_4 R_5 g_m - C_4 L_4 + C_5 L_5 R_5 g_m - C_5 L_5\right) + s\left(C_4 R_4 R_5 g_m - C_4 R_4 - C_5 R_5\right) - 1}{2C_4 C_5 L_4 L_5 g_m s^4 + 2g_m + s^3\left(2C_4 C_5 L_4 R_5 g_m + 2C_4 C_5 L_5 R_4 g_m + 2C_4 C_5 L_5 R_5 g_m + 2C_4 C_5 L_5\right) + s^2\left(2C_4 C_5 R_4 R_5 g_m + 2C_4 C_5 R_5 + 2C_4 L_4 g_m + 2C_5 L_5 g_m\right) + s\left(2C_4 R_4 g_m + 2C_4 R_5 g_m + 2C_4 + 2C_5 R_5 g_m\right)}$$

10.57 INVALID-ORDER-57 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2+L_4 s+R_4},\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{-C_5 L_4 R_4 s^2 + L_4 R_4 g_m s}{2C_4 C_5 L_4 R_4 s^3 + 2R_4 g_m + s^2\left(2C_4 L_4 R_4 g_m + 2C_5 L_4 R_4 g_m + 2C_5 L_4\right) + s\left(2C_5 R_4 + 2L_4 g_m\right)}$$

10.58 INVALID-ORDER-58 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2+L_4 s+R_4},\ \frac{R_5}{C_5 R_5 s+1},\ \infty\right)$

$$H(s) = \frac{-C_5 L_4 R_4 R_5 s^2 + s\left(L_4 R_4 R_5 g_m - L_4 R_4\right)}{2C_4 C_5 L_4 R_4 R_5 s^3 + 2R_4 R_5 g_m + 2R_4 + s^2\left(2C_4 L_4 R_4 R_5 g_m + 2C_4 L_4 R_4 + 2C_5 L_4 R_4 R_5 g_m + 2C_5 L_4 R_5\right) + s\left(2C_5 R_4 R_5 + 2L_4 R_4 g_m + 2L_4 R_5 g_m + 2L_4\right)}$$

10.59 INVALID-ORDER-59 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2+L_4 s+R_4},\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{L_4 R_4 g_m s + s^2\left(C_5 L_4 R_4 R_5 g_m - C_5 L_4 R_4\right)}{2R_4 g_m + s^3\left(2C_4 C_5 L_4 R_4 R_5 g_m + 2C_4 C_5 L_4 R_4\right) + s^2\left(2C_4 L_4 R_4 g_m + 2C_5 L_4 R_4 g_m + 2C_5 L_4 R_5 g_m + 2C_5 L_4\right) + s\left(2C_5 R_4 R_5 g_m + 2C_5 R_4 + 2L_4 g_m\right)}$$

10.60 INVALID-ORDER-60 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2+L_4 s+R_4},\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_4 L_5 R_4 g_m s^3 - C_5 L_4 R_4 s^2 + L_4 R_4 g_m s}{2C_4 C_5 L_4 L_5 R_4 g_m s^4 + 2R_4 g_m + s^3\left(2C_4 C_5 L_4 R_4 + 2C_5 L_4 L_5 g_m\right) + s^2\left(2C_4 L_4 R_4 g_m + 2C_5 L_4 R_4 g_m + 2C_5 L_4 + 2C_5 L_5 R_4 g_m\right) + s\left(2C_5 R_4 + 2L_4 g_m\right)}$$

10.61 INVALID-ORDER-61 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2+L_4 s+R_4},\ \frac{L_5 s}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = \frac{-C_5 L_4 L_5 R_4 s^3 + L_4 L_5 R_4 g_m s^2 - L_4 R_4 s}{2C_4 C_5 L_4 L_5 R_4 s^4 + 2R_4 + s^3\left(2C_4 L_4 L_5 R_4 g_m + 2C_5 L_4 L_5 R_4 g_m + 2C_5 L_4 L_5\right) + s^2\left(2C_4 L_4 R_4 + 2C_5 L_5 R_4 + 2L_4 L_5 g_m\right) + s\left(2L_4 R_4 g_m + 2L_4 + 2L_5 R_4 g_m\right)}$$

10.62 INVALID-ORDER-62 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2+L_4 s+R_4},\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_5 L_4 L_5 R_4 g_m s^3 + L_4 R_4 g_m s + s^2\left(C_5 L_4 R_4 R_5 g_m - C_5 L_4 R_4\right)}{2C_4 C_5 L_4 L_5 R_4 g_m s^4 + 2R_4 g_m + s^3\left(2C_4 C_5 L_4 R_4 R_5 g_m + 2C_4 C_5 L_4 R_4 + 2C_5 L_4 L_5 g_m\right) + s^2\left(2C_4 L_4 R_4 g_m + 2C_5 L_4 R_4 g_m + 2C_5 L_4 R_5 g_m + 2C_5 L_4 + 2C_5 L_5 R_4 g_m\right) + s\left(2C_5 R_4 R_5 g_m + 2C_5 R_4 + 2L_4 g_m\right)}$$

10.63 INVALID-ORDER-63 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2+L_4 s+R_4},\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5},\ \infty\right)$

$$H(s) = \frac{-C_5 L_4 L_5 R_4 R_5 s^3 - L_4 R_4 R_5 s + s^2\left(L_4 L_5 R_4 R_5 g_m - L_4 L_5 R_4\right)}{2C_4 C_5 L_4 L_5 R_4 R_5 s^4 + 2R_4 R_5 + s^3\left(2C_4 L_4 L_5 R_4 R_5 g_m + 2C_4 L_4 L_5 R_4 + 2C_5 L_4 L_5 R_4 R_5 g_m + 2C_5 L_4 L_5 R_5\right) + s^2\left(2C_4 L_4 R_4 R_5 + 2C_5 L_5 R_4 R_5 + 2L_4 L_5 R_4 g_m + 2L_4 L_5 R_5 g_m + 2L_4 L_5\right) + s\left(2L_4 R_4 R_5 g_m + 2L_4 R_5 + 2L_5 R_4 R_5 g_m + 2L_5 R_4\right)}$$

10.64 INVALID-ORDER-64 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2+L_4 s+R_4},\ \frac{C_5 L_5 R_5 s^2+L_5 s+R_5}{C_5 L_5 s^2+1},\ \infty\right)$

$$H(s) = \frac{L_4 L_5 R_4 g_m s^2 + s^3\left(C_5 L_4 L_5 R_4 R_5 g_m - C_5 L_4 L_5 R_4\right) + s\left(L_4 R_4 R_5 g_m - L_4 R_4\right)}{2R_4 R_5 g_m + 2R_4 + s^4\left(2C_4 C_5 L_4 L_5 R_4 R_5 g_m + 2C_4 C_5 L_4 L_5 R_4\right) + s^3\left(2C_4 L_4 L_5 R_4 g_m + 2C_5 L_4 L_5 R_4 g_m + 2C_5 L_4 L_5 R_5 g_m + 2C_5 L_4 L_5\right) + s^2\left(2C_4 L_4 R_4 R_5 g_m + 2C_4 L_4 R_4 + 2C_5 L_5 R_4 R_5 g_m + 2C_5 L_5 R_4 + 2L_4 L_5 g_m\right) + s\left(2L_4 R_4 g_m + 2L_4 R_5 g_m + 2L_4 + 2L_5 R_4 g_m\right)}$$

10.65 INVALID-ORDER-65 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{L_4 R_4 s}{C_4 L_4 R_4 s^2 + L_4 s + R_4},\ \frac{R_5\left(C_5 L_5 s^2 + 1\right)}{C_5 L_5 s^2 + C_5 R_5 s + 1},\ \infty\right)$

$$H(s) = \frac{-C_5 L_4 R_4 R_5 s^2 + s^3\left(C_5 L_4 L_5 R_4 R_5 g_m - C_5 L_4 L_5 R_4\right) + s\left(L_4 R_4 R_5 g_m - L_4 R_4\right)}{2R_4 R_5 g_m + 2R_4 + s^4\left(2C_4 C_5 L_4 L_5 R_4 R_5 g_m + 2C_4 C_5 L_4 L_5 R_4\right) + s^3\left(2C_4 C_5 L_4 R_4 R_5 + 2C_5 L_4 L_5 R_4 g_m + 2C_5 L_4 L_5 R_5 g_m + 2C_5 L_4 L_5\right) + s^2\left(2C_4 L_4 R_4 R_5 g_m + 2C_4 L_4 R_4 + 2C_5 L_4 R_4 R_5 g_m + 2C_5 L_4 R_5 + 2C_5 L_5 R_4 R_5 g_m + 2C_5 L_5 R_4\right) + s\left(2C_5 R_4 R_5 + 2L_4 R_4 g_m + 2L_4 R_5\right.$$

10.66 INVALID-ORDER-66 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1},\ \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 R_4 s^3 + R_4 g_m + s^2\left(C_4 L_4 R_4 g_m - C_5 L_4\right) + s\left(-C_5 R_4 + L_4 g_m\right)}{2g_m + s^3\left(2C_4 C_5 L_4 R_4 g_m + 2C_4 C_5 L_4\right) + s^2\left(2C_4 L_4 g_m + 2C_5 L_4 g_m\right) + s\left(2C_5 R_4 g_m + 2C_5\right)}$$

10.67 INVALID-ORDER-67 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1},\ \frac{R_5}{C_5 R_5 s + 1},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 R_4 R_5 s^3 + R_4 R_5 g_m - R_4 + s^2\left(C_4 L_4 R_4 R_5 g_m - C_4 L_4 R_4 - C_5 L_4 R_5\right) + s\left(-C_5 R_4 R_5 + L_4 R_5 g_m - L_4\right)}{2R_4 g_m + 2R_5 g_m + s^3\left(2C_4 C_5 L_4 R_4 R_5 g_m + 2C_4 C_5 L_4 R_5\right) + s^2\left(2C_4 L_4 R_4 g_m + 2C_4 L_4 R_5 g_m + 2C_4 L_4 + 2C_5 L_4 R_5 g_m\right) + s\left(2C_5 R_4 R_5 g_m + 2C_5 R_5 + 2L_4 g_m\right) + 2$$

10.68 INVALID-ORDER-68 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1},\ R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{R_4 g_m + s^3\left(C_4 C_5 L_4 R_4 R_5 g_m - C_4 C_5 L_4 R_4\right) + s^2\left(C_4 L_4 R_4 g_m + C_5 L_4 R_5 g_m - C_5 L_4\right) + s\left(C_5 R_4 R_5 g_m - C_5 R_4 + L_4 g_m\right)}{2g_m + s^3\left(2C_4 C_5 L_4 R_4 g_m + 2C_4 C_5 L_4 R_5 g_m + 2C_4 C_5 L_4\right) + s^2\left(2C_4 L_4 g_m + 2C_5 L_4 g_m\right) + s\left(2C_5 R_4 g_m + 2C_5 R_5 g_m + 2C_5\right)}$$

10.69 INVALID-ORDER-69 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1},\ L_5 s + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_4 C_5 L_4 L_5 R_4 g_m s^4 + R_4 g_m + s^3\left(-C_4 C_5 L_4 R_4 + C_5 L_4 L_5 g_m\right) + s^2\left(C_4 L_4 R_4 g_m - C_5 L_4 + C_5 L_5 R_4 g_m\right) + s\left(-C_5 R_4 + L_4 g_m\right)}{2C_4 C_5 L_4 L_5 g_m s^4 + 2g_m + s^3\left(2C_4 C_5 L_4 R_4 g_m + 2C_4 C_5 L_4\right) + s^2\left(2C_4 L_4 g_m + 2C_5 L_4 g_m + 2C_5 L_5 g_m\right) + s\left(2C_5 R_4 g_m + 2C_5\right)}$$

10.70 INVALID-ORDER-70 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1},\ \frac{L_5 s}{C_5 L_5 s^2 + 1},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 L_5 R_4 s^4 - R_4 + s^3\left(C_4 L_4 L_5 R_4 g_m - C_5 L_4 L_5\right) + s^2\left(-C_4 L_4 R_4 - C_5 L_5 R_4 + L_4 L_5 g_m\right) + s\left(-L_4 + L_5 R_4 g_m\right)}{2R_4 g_m + s^4\left(2C_4 C_5 L_4 L_5 R_4 g_m + 2C_4 C_5 L_4 L_5\right) + s^3\left(2C_4 L_4 L_5 g_m + 2C_5 L_4 L_5 g_m\right) + s^2\left(2C_4 L_4 R_4 g_m + 2C_4 L_4 + 2C_5 L_5 R_4 g_m + 2C_5 L_5\right) + s\left(2L_4 g_m + 2L_5 g_m\right) + 2}$$

10.71 INVALID-ORDER-71 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1},\ L_5 s + R_5 + \frac{1}{C_5 s},\ \infty\right)$

$$H(s) = \frac{C_4 C_5 L_4 L_5 R_4 g_m s^4 + R_4 g_m + s^3\left(C_4 C_5 L_4 R_4 R_5 g_m - C_4 C_5 L_4 R_4 + C_5 L_4 L_5 g_m\right) + s^2\left(C_4 L_4 R_4 g_m + C_5 L_4 R_5 g_m - C_5 L_4 + C_5 L_5 R_4 g_m\right) + s\left(C_5 R_4 R_5 g_m - C_5 R_4 + L_4 g_m\right)}{2C_4 C_5 L_4 L_5 g_m s^4 + 2g_m + s^3\left(2C_4 C_5 L_4 R_4 g_m + 2C_4 C_5 L_4 R_5 g_m + 2C_4 C_5 L_4\right) + s^2\left(2C_4 L_4 g_m + 2C_5 L_4 g_m + 2C_5 L_5 g_m\right) + s\left(2C_5 R_4 g_m + 2C_5 R_5 g_m + 2C_5\right)}$$

10.72 INVALID-ORDER-72 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1},\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5},\ \infty\right)$

$$H(s) = \frac{-C_4 C_5 L_4 L_5 R_4 R_5 s^4 - R_4 R_5 + s^3\left(C_4 L_4 L_5 R_4 R_5 g_m - C_4 L_4 L_5 R_4 - C_5 L_4 L_5 R_5\right) + s^2\left(-C_4 L_4 R_4 R_5 - C_5 L_5 R_4 R_5 + L_4 L_5 R_5 g_m - L_4 L_5\right) + s\left(-L_4 R_5 + L_5 R_4 R_5 g_m - L_5 R_4\right)}{2R_4 R_5 g_m + 2R_5 + s^4\left(2C_4 C_5 L_4 L_5 R_4 R_5 g_m + 2C_4 C_5 L_4 L_5 R_5\right) + s^3\left(2C_4 L_4 L_5 R_4 g_m + 2C_4 L_4 L_5 R_5 g_m + 2C_4 L_4 L_5 + 2C_5 L_4 L_5 R_5 g_m\right) + s^2\left(2C_4 L_4 R_4 R_5 g_m + 2C_4 L_4 R_5 + 2C_5 L_5 R_4 R_5 g_m + 2C_5 L_5 R_5 + 2L_4 L_5 g_m\right) + s\left(2L_4 R_5 g_m + 2L_5 R_4 g_m + 2L_5 R_5 g_m + 2L_5\right)}$$

10.73 INVALID-ORDER-73 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 L_4 s^2 + 1},\ \frac{C_5 L_5 R_5 s^2 + L_5 s + R_5}{C_5 L_5 s^2 + 1},\ \infty\right)$

$$H(s) = \frac{R_4 R_5 g_m - R_4 + s^4\left(C_4 C_5 L_4 L_5 R_4 R_5 g_m - C_4 C_5 L_4 L_5 R_4\right) + s^3\left(C_4 L_4 L_5 R_4 g_m + C_5 L_4 L_5 R_5 g_m - C_5 L_4 L_5\right) + s^2\left(C_4 L_4 R_4 R_5 g_m - C_4 L_4 R_4 + C_5 L_5 R_4 R_5 g_m - C_5 L_5 R_4 + L_4 L_5 g_m\right) + s\left(L_4 R_5 g_m - L_4 + L_5 R_4 g_m\right)}{2R_4 g_m + 2R_5 g_m + s^4\left(2C_4 C_5 L_4 L_5 R_4 g_m + 2C_4 C_5 L_4 L_5 R_5 g_m + 2C_4 C_5 L_4 L_5\right) + s^3\left(2C_4 L_4 L_5 g_m + 2C_5 L_4 L_5 g_m\right) + s^2\left(2C_4 L_4 R_4 g_m + 2C_4 L_4 R_5 g_m + 2C_4 L_4 + 2C_5 L_5 R_4 g_m + 2C_5 L_5 R_5 g_m + 2C_5 L_5\right) + s\left(2L_4 g_m + 2L_5 g_m\right) + 2}$$

10.74 INVALID-ORDER-74 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{C_4L_4R_4s^2+L_4s+R_4}{C_4L_4s^2+1},\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1},\ \infty\right)$

$$H(s) = \frac{R_4R_5g_m - R_4 + s^4\left(C_4C_5L_4L_5R_4R_5g_m - C_4C_5L_4L_5R_4\right) + s^3\left(-C_4C_5L_4R_4R_5 + C_5L_4L_5R_5g_m - C_5L_4L_5\right) + s^2\left(C_4L_4R_4R_5g_m - C_4L_4R_4 - C_5L_4R_5 + C_5L_5R_4R_5g_m - C_5L_5R_4\right) + s\left(-C_5R_4R_5 + L_4R_5g_m - L_4\right)}{2R_4g_m + 2R_5g_m + s^4\left(2C_4C_5L_4L_5R_4g_m + 2C_4C_5L_4L_5R_5g_m + 2C_4C_5L_4L_5\right) + s^3\left(2C_4C_5L_4R_4R_5g_m + 2C_4C_5L_4R_5 + 2C_5L_4L_5g_m\right) + s^2\left(2C_4L_4R_4g_m + 2C_4L_4R_5g_m + 2C_4L_4 + 2C_5L_4R_5g_m + 2C_5L_5R_4g_m + 2C_5L_5R_5g_m + 2C_5L_5\right) + s\left(2C_5R_4R_5g_m + 2C_5R_5 + 2L\right.}$$

10.75 INVALID-ORDER-75 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4\left(C_4L_4s^2+1\right)}{C_4L_4s^2+C_4R_4s+1},\ \frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{-C_4C_5L_4R_4s^3 + C_4L_4R_4g_ms^2 - C_5R_4s + R_4g_m}{2g_m + s^3\left(2C_4C_5L_4R_4g_m + 2C_4C_5L_4\right) + s^2\left(2C_4C_5R_4 + 2C_4L_4g_m\right) + s\left(2C_4R_4g_m + 2C_5R_4g_m + 2C_5\right)}$$

10.76 INVALID-ORDER-76 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4\left(C_4L_4s^2+1\right)}{C_4L_4s^2+C_4R_4s+1},\ \frac{R_5}{C_5R_5s+1},\ \infty\right)$

$$H(s) = \frac{-C_4C_5L_4R_4R_5s^3 - C_5R_4R_5s + R_4R_5g_m - R_4 + s^2\left(C_4L_4R_4R_5g_m - C_4L_4R_4\right)}{2R_4g_m + 2R_5g_m + s^3\left(2C_4C_5L_4R_4R_5g_m + 2C_4C_5L_4R_5\right) + s^2\left(2C_4C_5R_4R_5 + 2C_4L_4R_4g_m + 2C_4L_4R_5g_m + 2C_4L_4\right) + s\left(2C_4R_4R_5g_m + 2C_4R_4 + 2C_5R_4R_5g_m + 2C_5R_5\right) + 2}$$

10.77 INVALID-ORDER-77 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4\left(C_4L_4s^2+1\right)}{C_4L_4s^2+C_4R_4s+1},\ R_5 + \frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{C_4L_4R_4g_ms^2 + R_4g_m + s^3\left(C_4C_5L_4R_4R_5g_m - C_4C_5L_4R_4\right) + s\left(C_5R_4R_5g_m - C_5R_4\right)}{2g_m + s^3\left(2C_4C_5L_4R_4g_m + 2C_4C_5L_4R_5g_m + 2C_4C_5L_4\right) + s^2\left(2C_4C_5R_4R_5g_m + 2C_4C_5R_4 + 2C_4L_4g_m\right) + s\left(2C_4R_4g_m + 2C_5R_4g_m + 2C_5R_5g_m + 2C_5\right)}$$

10.78 INVALID-ORDER-78 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4\left(C_4L_4s^2+1\right)}{C_4L_4s^2+C_4R_4s+1},\ L_5s + \frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{C_4C_5L_4L_5R_4g_ms^4 - C_4C_5L_4R_4s^3 - C_5R_4s + R_4g_m + s^2\left(C_4L_4R_4g_m + C_5L_5R_4g_m\right)}{2C_4C_5L_4L_5g_ms^4 + 2g_m + s^3\left(2C_4C_5L_4R_4g_m + 2C_4C_5L_4 + 2C_4C_5L_5R_4g_m\right) + s^2\left(2C_4C_5R_4 + 2C_4L_4g_m + 2C_5L_5g_m\right) + s\left(2C_4R_4g_m + 2C_5R_4g_m + 2C_5\right)}$$

10.79 INVALID-ORDER-79 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4\left(C_4L_4s^2+1\right)}{C_4L_4s^2+C_4R_4s+1},\ \frac{L_5s}{C_5L_5s^2+1},\ \infty\right)$

$$H(s) = \frac{-C_4C_5L_4L_5R_4s^4 + C_4L_4L_5R_4g_ms^3 + L_5R_4g_ms - R_4 + s^2\left(-C_4L_4R_4 - C_5L_5R_4\right)}{2R_4g_m + s^4\left(2C_4C_5L_4L_5R_4g_m + 2C_4C_5L_4L_5\right) + s^3\left(2C_4C_5L_5R_4 + 2C_4L_4L_5g_m\right) + s^2\left(2C_4L_4R_4g_m + 2C_4L_4 + 2C_4L_5R_4g_m + 2C_5L_5R_4g_m + 2C_5L_5\right) + s\left(2C_4R_4 + 2L_5g_m\right) + 2}$$

10.80 INVALID-ORDER-80 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4\left(C_4L_4s^2+1\right)}{C_4L_4s^2+C_4R_4s+1},\ L_5s + R_5 + \frac{1}{C_5s},\ \infty\right)$

$$H(s) = \frac{C_4C_5L_4L_5R_4g_ms^4 + R_4g_m + s^3\left(C_4C_5L_4R_4R_5g_m - C_4C_5L_4R_4\right) + s^2\left(C_4L_4R_4g_m + C_5L_5R_4g_m\right) + s\left(C_5R_4R_5g_m - C_5R_4\right)}{2C_4C_5L_4L_5g_ms^4 + 2g_m + s^3\left(2C_4C_5L_4R_4g_m + 2C_4C_5L_4R_5g_m + 2C_4C_5L_4 + 2C_4C_5L_5R_4g_m\right) + s^2\left(2C_4C_5R_4R_5g_m + 2C_4C_5R_4 + 2C_4L_4g_m + 2C_5L_5g_m\right) + s\left(2C_4R_4g_m + 2C_5R_4g_m + 2C_5R_5g_m + 2C_5\right)}$$

10.81 INVALID-ORDER-81 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4\left(C_4L_4s^2+1\right)}{C_4L_4s^2+C_4R_4s+1},\ \frac{L_5R_5s}{C_5L_5R_5s^2+L_5s+R_5},\ \infty\right)$

$$H(s) = \frac{-C_4C_5L_4L_5R_4R_5s^4 - R_4R_5 + s^3\left(C_4L_4L_5R_4R_5g_m - C_4L_4L_5R_4\right) + s^2\left(-C_4L_4R_4R_5 - C_5L_5R_4R_5\right) + s\left(L_5R_4R_5g_m - L_5R_4\right)}{2R_4R_5g_m + 2R_5 + s^4\left(2C_4C_5L_4L_5R_4R_5g_m + 2C_4C_5L_4L_5R_5\right) + s^3\left(2C_4C_5L_5R_4R_5 + 2C_4L_4L_5R_4g_m + 2C_4L_4L_5R_5g_m + 2C_4L_4L_5\right) + s^2\left(2C_4L_4R_4R_5g_m + 2C_4L_4R_5 + 2C_4L_5R_4R_5g_m + 2C_4L_5R_4 + 2C_5L_5R_4R_5g_m + 2C_5L_5R_5\right) + s\left(2C_4R_4R_5 + 2L_5R_4g_m + 2L_5R_5\right.}$$

10.82 INVALID-ORDER-82 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4\left(C_4L_4s^2+1\right)}{C_4L_4s^2+C_4R_4s+1},\ \frac{C_5L_5R_5s^2+L_5s+R_5}{C_5L_5s^2+1},\ \infty\right)$

$$H(s) = \frac{C_4L_4L_5R_4g_ms^3 + L_5R_4g_ms + R_4R_5g_m - R_4 + s^4\left(C_4C_5L_4L_5R_4R_5g_m - C_4C_5L_4L_5R_4\right) + s^2\left(C_4L_4R_4R_5g_m - C_4L_4R_4 + C_5L_5R_4R_5g_m - C_5L_5R_4\right)}{2R_4g_m + 2R_5g_m + s^4\left(2C_4C_5L_4L_5R_4g_m + 2C_4C_5L_4L_5R_5g_m + 2C_4C_5L_4L_5\right) + s^3\left(2C_4C_5L_5R_4R_5g_m + 2C_4C_5L_5R_4 + 2C_4L_4L_5g_m\right) + s^2\left(2C_4L_4R_4g_m + 2C_4L_4R_5g_m + 2C_4L_4 + 2C_4L_5R_4g_m + 2C_5L_5R_4g_m + 2C_5L_5R_5g_m + 2C_5L_5\right) + s\left(2C_4R_4R_5g_m + 2C_4R_4 + 2L\right.}$$

10.83 INVALID-ORDER-83 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \frac{R_4\left(C_4L_4s^2+1\right)}{C_4L_4s^2+C_4R_4s+1},\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1},\ \infty\right)$

$$H(s) = \frac{-C_4C_5L_4R_4R_5s^3 - C_5R_4R_5s + R_4R_5g_m - R_4 + s^4\left(C_4C_5L_4L_5R_4R_5g_m - C_4C_5L_4L_5R_4\right) + s^2\left(C_4L_4R_4R_5g_m - C_4L_4R_4 + C_5L_5R_4R_5g_m - C_5L_5R_4\right)}{2R_4g_m + 2R_5g_m + s^4\left(2C_4C_5L_4L_5R_4g_m + 2C_4C_5L_4L_5R_5g_m + 2C_4C_5L_4L_5\right) + s^3\left(2C_4C_5L_4R_4R_5g_m + 2C_4C_5L_4R_5 + 2C_4C_5L_5R_4R_5g_m + 2C_4C_5L_5R_4\right) + s^2\left(2C_4C_5R_4R_5 + 2C_4L_4R_4g_m + 2C_4L_4R_5g_m + 2C_4L_4 + 2C_5L_5R_4g_m + 2C_5L_5R_5g_m + 2C_5L_5\right) + s\left(2C_4R_4\right.}$$

11 PolynomialError