Filter Summary Report: CG,TIA,simple,Z2,Z5

Generated by MacAnalog-Symbolix

January 18, 2025

Contents

1 Examined $H(z)$ for CG TIA simple Z2 Z5: $\frac{Z_2 Z_5 Z_L g_m - Z_2 Z_L + Z_5 Z_L}{Z_2 Z_5 g_m + 2 Z_2 Z_L g_m + Z_2 + Z_5 + 4 Z_L}$

$$H(z) = \frac{Z_2 Z_5 Z_L g_m - Z_2 Z_L + Z_5 Z_L}{Z_2 Z_5 g_m + 2 Z_2 Z_L g_m + Z_2 + Z_5 + 4 Z_L}$$

2 HP

3 BP

4 LP

5 BS

6 GE

6.1 GE-1 $Z(s) = \left(\infty,\ R_2,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_5 R_2 Z_L s + R_2 Z_L g_m + Z_L + s^2 \left(C_5 L_5 R_2 Z_L g_m + C_5 L_5 Z_L\right)}{R_2 g_m + s^2 \left(C_5 L_5 R_2 g_m + C_5 L_5\right) + s \left(2 C_5 R_2 Z_L g_m + C_5 R_2 + 4 C_5 Z_L\right) + 1}$$

Parameters:

Q: $\frac{L_5 R_2 g_m \sqrt{\frac{1}{C_5 L_5}} + L_5 \sqrt{\frac{1}{C_5 L_5}}}{2 R_2 Z_L g_m + R_2 + 4 Z_L}$
wo: $\sqrt{\frac{1}{C_5 L_5}}$
bandwidth: $\frac{\sqrt{\frac{1}{C_5 L_5}} (2 R_2 Z_L g_m + R_2 + 4 Z_L)}{L_5 R_2 g_m \sqrt{\frac{1}{C_5 L_5}} + L_5 \sqrt{\frac{1}{C_5 L_5}}}$
K-LP: Z_L
K-HP: Z_L
K-BP: $-\frac{R_2 Z_L}{2 R_2 Z_L g_m + R_2 + 4 Z_L}$
Qz: $\frac{-L_5 R_2 g_m \sqrt{\frac{1}{C_5 L_5}} - L_5 \sqrt{\frac{1}{C_5 L_5}}}{R_2}$
Wz: $\sqrt{\frac{1}{C_5 L_5}}$

6.2 GE-2 $Z(s) = \left(\infty,\ R_2,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{-C_5 L_5 R_2 Z_L s^2 - R_2 Z_L + s \left(L_5 R_2 Z_L g_m + L_5 Z_L\right)}{2 R_2 Z_L g_m + R_2 + 4 Z_L + s^2 \left(2 C_5 L_5 R_2 Z_L g_m + C_5 L_5 R_2 + 4 C_5 L_5 Z_L\right) + s \left(L_5 R_2 g_m + L_5\right)}$$

Parameters:

Q: $\frac{2 C_5 R_2 Z_L g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_2 \sqrt{\frac{1}{C_5 L_5}} + 4 C_5 Z_L \sqrt{\frac{1}{C_5 L_5}}}{R_2 g_m + 1}$
wo: $\sqrt{\frac{1}{C_5 L_5}}$
bandwidth: $\frac{\sqrt{\frac{1}{C_5 L_5}} (R_2 g_m + 1)}{2 C_5 R_2 Z_L g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_2 \sqrt{\frac{1}{C_5 L_5}} + 4 C_5 Z_L \sqrt{\frac{1}{C_5 L_5}}}$
K-LP: $-\frac{R_2 Z_L}{2 R_2 Z_L g_m + R_2 + 4 Z_L}$
K-HP: $-\frac{R_2 Z_L}{2 R_2 Z_L g_m + R_2 + 4 Z_L}$
K-BP: Z_L
Qz: $-\frac{C_5 R_2 \sqrt{\frac{1}{C_5 L_5}}}{R_2 g_m + 1}$
Wz: $\sqrt{\frac{1}{C_5 L_5}}$

6.3 GE-3 $Z(s) = \left(\infty,\ R_2,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{R_2 Z_L g_m + Z_L + s^2 \left(C_5 L_5 R_2 Z_L g_m + C_5 L_5 Z_L\right) + s \left(C_5 R_2 R_5 Z_L g_m - C_5 R_2 Z_L + C_5 R_5 Z_L\right)}{R_2 g_m + s^2 \left(C_5 L_5 R_2 g_m + C_5 L_5\right) + s \left(C_5 R_2 R_5 g_m + 2 C_5 R_2 Z_L g_m + C_5 R_2 + C_5 R_5 + 4 C_5 Z_L\right) + 1}$$

Parameters:

Q: $\frac{L_5 R_2 g_m \sqrt{\frac{1}{C_5 L_5}} + L_5 \sqrt{\frac{1}{C_5 L_5}}}{R_2 R_5 g_m + 2 R_2 Z_L g_m + R_2 + R_5 + 4 Z_L}$

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

bandwidth: $\frac{\sqrt{\frac{1}{C_5 L_5}} \left(R_2 R_5 g_m + 2 R_2 Z_L g_m + R_2 + R_5 + 4 Z_L\right)}{L_5 R_2 g_m \sqrt{\frac{1}{C_5 L_5}} + L_5 \sqrt{\frac{1}{C_5 L_5}}}$

K-LP: Z_L

K-HP: Z_L

K-BP: $\frac{R_2 R_5 Z_L g_m - R_2 Z_L + R_5 Z_L}{R_2 R_5 g_m + 2 R_2 Z_L g_m + R_2 + R_5 + 4 Z_L}$

Qz: $\frac{L_5 R_2 g_m \sqrt{\frac{1}{C_5 L_5}} + L_5 \sqrt{\frac{1}{C_5 L_5}}}{R_2 R_5 g_m - R_2 + R_5}$

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

6.4 GE-4 $Z(s) = \left(\infty,\ R_2,\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5}\right)$

$$H(s) = \frac{-C_5 L_5 R_2 R_5 Z_L s^2 - R_2 R_5 Z_L + s \left(L_5 R_2 R_5 Z_L g_m - L_5 R_2 Z_L + L_5 R_5 Z_L\right)}{2 R_2 R_5 Z_L g_m + R_2 R_5 + 4 R_5 Z_L + s^2 \left(2 C_5 L_5 R_2 R_5 Z_L g_m + C_5 L_5 R_2 R_5 + 4 C_5 L_5 R_5 Z_L\right) + s \left(L_5 R_2 R_5 g_m + 2 L_5 R_2 Z_L g_m + L_5 R_2 + L_5 R_5 + 4 L_5 Z_L\right)}$$

Parameters:

Q: $\frac{2 C_5 R_2 R_5 Z_L g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_2 R_5 \sqrt{\frac{1}{C_5 L_5}} + 4 C_5 R_5 Z_L \sqrt{\frac{1}{C_5 L_5}}}{R_2 R_5 g_m + 2 R_2 Z_L g_m + R_2 + R_5 + 4 Z_L}$

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

bandwidth: $\frac{\sqrt{\frac{1}{C_5 L_5}} \left(R_2 R_5 g_m + 2 R_2 Z_L g_m + R_2 + R_5 + 4 Z_L\right)}{2 C_5 R_2 R_5 Z_L g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_2 R_5 \sqrt{\frac{1}{C_5 L_5}} + 4 C_5 R_5 Z_L \sqrt{\frac{1}{C_5 L_5}}}$

K-LP: $-\frac{R_2 Z_L}{2 R_2 Z_L g_m + R_2 + 4 Z_L}$

K-HP: $-\frac{R_2 Z_L}{2 R_2 Z_L g_m + R_2 + 4 Z_L}$

K-BP: $\frac{R_2 R_5 Z_L g_m - R_2 Z_L + R_5 Z_L}{R_2 R_5 g_m + 2 R_2 Z_L g_m + R_2 + R_5 + 4 Z_L}$

Qz: $-\frac{C_5 R_2 R_5 \sqrt{\frac{1}{C_5 L_5}}}{R_2 R_5 g_m - R_2 + R_5}$

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

6.5 GE-5 $Z(s) = \left(\infty,\ R_2,\ \infty,\ \infty,\ \frac{C_5 L_5 R_5 s^2 + L_5 s + R_5}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{R_2 R_5 Z_L g_m - R_2 Z_L + R_5 Z_L + s^2 \left(C_5 L_5 R_2 R_5 Z_L g_m - C_5 L_5 R_2 Z_L + C_5 L_5 R_5 Z_L\right) + s \left(L_5 R_2 Z_L g_m + L_5 Z_L\right)}{R_2 R_5 g_m + 2 R_2 Z_L g_m + R_2 + R_5 + 4 Z_L + s^2 \left(C_5 L_5 R_2 R_5 g_m + 2 C_5 L_5 R_2 Z_L g_m + C_5 L_5 R_2 + C_5 L_5 R_5 + 4 C_5 L_5 Z_L\right) + s \left(L_5 R_2 g_m + L_5\right)}$$

Parameters:

Q: $\frac{C_5 R_2 R_5 g_m \sqrt{\frac{1}{C_5 L_5}} + 2 C_5 R_2 Z_L g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_2 \sqrt{\frac{1}{C_5 L_5}} + C_5 R_5 \sqrt{\frac{1}{C_5 L_5}} + 4 C_5 Z_L \sqrt{\frac{1}{C_5 L_5}}}{R_2 g_m + 1}$

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

bandwidth: $\frac{\sqrt{\frac{1}{C_5 L_5}} \left(R_2 g_m + 1\right)}{C_5 R_2 R_5 g_m \sqrt{\frac{1}{C_5 L_5}} + 2 C_5 R_2 Z_L g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_2 \sqrt{\frac{1}{C_5 L_5}} + C_5 R_5 \sqrt{\frac{1}{C_5 L_5}} + 4 C_5 Z_L \sqrt{\frac{1}{C_5 L_5}}}$

K-LP: $\frac{R_2 R_5 Z_L g_m - R_2 Z_L + R_5 Z_L}{R_2 R_5 g_m + 2 R_2 Z_L g_m + R_2 + R_5 + 4 Z_L}$

K-HP: $\frac{R_2 R_5 Z_L g_m - R_2 Z_L + R_5 Z_L}{R_2 R_5 g_m + 2 R_2 Z_L g_m + R_2 + R_5 + 4 Z_L}$

K-BP: Z_L

Qz: $\frac{C_5 R_2 R_5 g_m \sqrt{\frac{1}{C_5 L_5}} - C_5 R_2 \sqrt{\frac{1}{C_5 L_5}} + C_5 R_5 \sqrt{\frac{1}{C_5 L_5}}}{R_2 g_m + 1}$

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

6.6 GE-6 $Z(s) = \left(\infty,\ R_2,\ \infty,\ \infty,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1}\right)$

$$H(s) = \frac{-C_5R_2R_5Z_Ls + R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L + s^2\left(C_5L_5R_2R_5Z_Lg_m - C_5L_5R_2Z_L + C_5L_5R_5Z_L\right)}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s^2\left(C_5L_5R_2R_5g_m + 2C_5L_5R_2Z_Lg_m + C_5L_5R_2 + C_5L_5R_5 + 4C_5L_5Z_L\right) + s\left(2C_5R_2R_5Z_Lg_m + C_5R_2R_5 + 4C_5R_5Z_L\right)}$$

Parameters:

Q: $\frac{L_5R_2R_5g_m\sqrt{\frac{1}{C_5L_5}}+2L_5R_2Z_Lg_m\sqrt{\frac{1}{C_5L_5}}+L_5R_2\sqrt{\frac{1}{C_5L_5}}+L_5R_5\sqrt{\frac{1}{C_5L_5}}+4L_5Z_L\sqrt{\frac{1}{C_5L_5}}}{2R_2R_5Z_Lg_m+R_2R_5+4R_5Z_L}$

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

bandwidth: $\frac{\sqrt{\frac{1}{C_5L_5}}(2R_2R_5Z_Lg_m+R_2R_5+4R_5Z_L)}{L_5R_2R_5g_m\sqrt{\frac{1}{C_5L_5}}+2L_5R_2Z_Lg_m\sqrt{\frac{1}{C_5L_5}}+L_5R_2\sqrt{\frac{1}{C_5L_5}}+L_5R_5\sqrt{\frac{1}{C_5L_5}}+4L_5Z_L\sqrt{\frac{1}{C_5L_5}}}$

K-LP: $\frac{R_2R_5Z_Lg_m-R_2Z_L+R_5Z_L}{R_2R_5g_m+2R_2Z_Lg_m+R_2+R_5+4Z_L}$

K-HP: $\frac{R_2R_5Z_Lg_m-R_2Z_L+R_5Z_L}{R_2R_5g_m+2R_2Z_Lg_m+R_2+R_5+4Z_L}$

K-BP: $-\frac{R_2Z_L}{2R_2Z_Lg_m+R_2+4Z_L}$

Qz: $\frac{-L_5R_2R_5g_m\sqrt{\frac{1}{C_5L_5}}+L_5R_2\sqrt{\frac{1}{C_5L_5}}-L_5R_5\sqrt{\frac{1}{C_5L_5}}}{R_2R_5}$

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

6.7 GE-7 $Z(s) = \left(\infty,\ L_2s + \frac{1}{C_2s},\ \infty,\ \infty,\ R_5\right)$

$$H(s) = \frac{C_2R_5Z_Ls + R_5Z_Lg_m - Z_L + s^2\left(C_2L_2R_5Z_Lg_m - C_2L_2Z_L\right)}{R_5g_m + 2Z_Lg_m + s^2\left(C_2L_2R_5g_m + 2C_2L_2Z_Lg_m + C_2L_2\right) + s\left(C_2R_5 + 4C_2Z_L\right) + 1}$$

Parameters:

Q: $\frac{L_2R_5g_m\sqrt{\frac{1}{C_2L_2}}+2L_2Z_Lg_m\sqrt{\frac{1}{C_2L_2}}+L_2\sqrt{\frac{1}{C_2L_2}}}{R_5+4Z_L}$

wo: $\sqrt{\frac{1}{C_2L_2}}$

bandwidth: $\frac{\sqrt{\frac{1}{C_2L_2}}(R_5+4Z_L)}{L_2R_5g_m\sqrt{\frac{1}{C_2L_2}}+2L_2Z_Lg_m\sqrt{\frac{1}{C_2L_2}}+L_2\sqrt{\frac{1}{C_2L_2}}}$

K-LP: $\frac{R_5Z_Lg_m-Z_L}{R_5g_m+2Z_Lg_m+1}$

K-HP: $\frac{R_5Z_Lg_m-Z_L}{R_5g_m+2Z_Lg_m+1}$

K-BP: $\frac{R_5Z_L}{R_5+4Z_L}$

Qz: $\frac{L_2R_5g_m\sqrt{\frac{1}{C_2L_2}}-L_2\sqrt{\frac{1}{C_2L_2}}}{R_5}$

Wz: $\sqrt{\frac{1}{C_2L_2}}$

6.8 GE-8 $Z(s) = \left(\infty,\ L_2s + R_2 + \frac{1}{C_2s},\ \infty,\ \infty,\ R_5\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s^2\left(C_2L_2R_5Z_Lg_m - C_2L_2Z_L\right) + s\left(C_2R_2R_5Z_Lg_m - C_2R_2Z_L + C_2R_5Z_L\right)}{R_5g_m + 2Z_Lg_m + s^2\left(C_2L_2R_5g_m + 2C_2L_2Z_Lg_m + C_2L_2\right) + s\left(C_2R_2R_5g_m + 2C_2R_2Z_Lg_m + C_2R_2 + C_2R_5 + 4C_2Z_L\right) + 1}$$

Parameters:

Q: $\frac{L_2R_5g_m\sqrt{\frac{1}{C_2L_2}}+2L_2Z_Lg_m\sqrt{\frac{1}{C_2L_2}}+L_2\sqrt{\frac{1}{C_2L_2}}}{R_2R_5g_m+2R_2Z_Lg_m+R_2+R_5+4Z_L}$

wo: $\sqrt{\frac{1}{C_2L_2}}$

bandwidth: $\frac{\sqrt{\frac{1}{C_2L_2}}(R_2R_5g_m+2R_2Z_Lg_m+R_2+R_5+4Z_L)}{L_2R_5g_m\sqrt{\frac{1}{C_2L_2}}+2L_2Z_Lg_m\sqrt{\frac{1}{C_2L_2}}+L_2\sqrt{\frac{1}{C_2L_2}}}$

K-LP: $\frac{R_5Z_Lg_m-Z_L}{R_5g_m+2Z_Lg_m+1}$

K-HP: $\frac{R_5Z_Lg_m-Z_L}{R_5g_m+2Z_Lg_m+1}$

K-BP: $\frac{R_2R_5Z_Lg_m-R_2Z_L+R_5Z_L}{R_2R_5g_m+2R_2Z_Lg_m+R_2+R_5+4Z_L}$

Qz: $\frac{L_2R_5g_m\sqrt{\frac{1}{C_2L_2}}-L_2\sqrt{\frac{1}{C_2L_2}}}{R_2R_5g_m-R_2+R_5}$

Wz: $\sqrt{\frac{1}{C_2L_2}}$

6.9 GE-9 $Z(s) = \left(\infty,\ \frac{C_2L_2R_2s^2+L_2s+R_2}{C_2L_2s^2+1},\ \infty,\ \infty,\ R_5\right)$

$$H(s) = \frac{R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L + s^2\left(C_2L_2R_2R_5Z_Lg_m - C_2L_2R_2Z_L + C_2L_2R_5Z_L\right) + s\left(L_2R_5Z_Lg_m - L_2Z_L\right)}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s^2\left(C_2L_2R_2R_5g_m + 2C_2L_2R_2Z_Lg_m + C_2L_2R_2 + C_2L_2R_5 + 4C_2L_2Z_L\right) + s\left(L_2R_5g_m + 2L_2Z_Lg_m + L_2\right)}$$

Parameters:

Q: $\frac{C_2R_2R_5g_m\sqrt{\frac{1}{C_2L_2}}+2C_2R_2Z_Lg_m\sqrt{\frac{1}{C_2L_2}}+C_2R_2\sqrt{\frac{1}{C_2L_2}}+C_2R_5\sqrt{\frac{1}{C_2L_2}}+4C_2Z_L\sqrt{\frac{1}{C_2L_2}}}{R_5g_m+2Z_Lg_m+1}$
wo: $\sqrt{\frac{1}{C_2L_2}}$
bandwidth: $\frac{\sqrt{\frac{1}{C_2L_2}}(R_5g_m+2Z_Lg_m+1)}{C_2R_2R_5g_m\sqrt{\frac{1}{C_2L_2}}+2C_2R_2Z_Lg_m\sqrt{\frac{1}{C_2L_2}}+C_2R_2\sqrt{\frac{1}{C_2L_2}}+C_2R_5\sqrt{\frac{1}{C_2L_2}}+4C_2Z_L\sqrt{\frac{1}{C_2L_2}}}$
K-LP: $\frac{R_2R_5Z_Lg_m-R_2Z_L+R_5Z_L}{R_2R_5g_m+2R_2Z_Lg_m+R_2+R_5+4Z_L}$
K-HP: $\frac{R_2R_5Z_Lg_m-R_2Z_L+R_5Z_L}{R_2R_5g_m+2R_2Z_Lg_m+R_2+R_5+4Z_L}$
K-BP: $\frac{R_5Z_Lg_m-Z_L}{R_5g_m+2Z_Lg_m+1}$
Qz: $\frac{C_2R_2R_5g_m\sqrt{\frac{1}{C_2L_2}}-C_2R_2\sqrt{\frac{1}{C_2L_2}}+C_2R_5\sqrt{\frac{1}{C_2L_2}}}{R_5g_m-1}$
Wz: $\sqrt{\frac{1}{C_2L_2}}$

6.10 GE-10 $Z(s) = \left(\infty,\ \frac{R_2\left(C_2L_2s^2+1\right)}{C_2L_2s^2+C_2R_2s+1},\ \infty,\ \infty,\ R_5\right)$

$$H(s) = \frac{C_2R_2R_5Z_Ls + R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L + s^2\left(C_2L_2R_2R_5Z_Lg_m - C_2L_2R_2Z_L + C_2L_2R_5Z_L\right)}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s^2\left(C_2L_2R_2R_5g_m + 2C_2L_2R_2Z_Lg_m + C_2L_2R_2 + C_2L_2R_5 + 4C_2L_2Z_L\right) + s\left(C_2R_2R_5 + 4C_2R_2Z_L\right)}$$

Parameters:

Q: $\frac{L_2R_2R_5g_m\sqrt{\frac{1}{C_2L_2}}+2L_2R_2Z_Lg_m\sqrt{\frac{1}{C_2L_2}}+L_2R_2\sqrt{\frac{1}{C_2L_2}}+L_2R_5\sqrt{\frac{1}{C_2L_2}}+4L_2Z_L\sqrt{\frac{1}{C_2L_2}}}{R_2R_5+4R_2Z_L}$
wo: $\sqrt{\frac{1}{C_2L_2}}$
bandwidth: $\frac{\sqrt{\frac{1}{C_2L_2}}(R_2R_5+4R_2Z_L)}{L_2R_2R_5g_m\sqrt{\frac{1}{C_2L_2}}+2L_2R_2Z_Lg_m\sqrt{\frac{1}{C_2L_2}}+L_2R_2\sqrt{\frac{1}{C_2L_2}}+L_2R_5\sqrt{\frac{1}{C_2L_2}}+4L_2Z_L\sqrt{\frac{1}{C_2L_2}}}$
K-LP: $\frac{R_2R_5Z_Lg_m-R_2Z_L+R_5Z_L}{R_2R_5g_m+2R_2Z_Lg_m+R_2+R_5+4Z_L}$
K-HP: $\frac{R_2R_5Z_Lg_m-R_2Z_L+R_5Z_L}{R_2R_5g_m+2R_2Z_Lg_m+R_2+R_5+4Z_L}$
K-BP: $\frac{R_5Z_L}{R_5+4Z_L}$
Qz: $\frac{L_2R_2R_5g_m\sqrt{\frac{1}{C_2L_2}}-L_2R_2\sqrt{\frac{1}{C_2L_2}}+L_2R_5\sqrt{\frac{1}{C_2L_2}}}{R_2R_5}$
Wz: $\sqrt{\frac{1}{C_2L_2}}$

7 AP

8 INVALID-NUMER

8.1 INVALID-NUMER-1 $Z(s) = \left(\infty,\ \frac{1}{C_2s},\ \infty,\ \infty,\ \frac{1}{C_5s}\right)$

$$H(s) = \frac{Z_Lg_m + s\left(C_2Z_L - C_5Z_L\right)}{4C_2C_5Z_Ls^2 + g_m + s\left(C_2 + 2C_5Z_Lg_m + C_5\right)}$$

Parameters:

Q: $\frac{2C_2C_5Z_L\sqrt{\frac{g_m}{C_2C_5Z_L}}}{C_2+2C_5Z_Lg_m+C_5}$
wo: $\frac{\sqrt{\frac{g_m}{C_2C_5Z_L}}}{2}$
bandwidth: $\frac{C_2+2C_5Z_Lg_m+C_5}{4C_2C_5Z_L}$
K-LP: Z_L
K-HP: 0

K-BP: $\frac{C_2 Z_L - C_5 Z_L}{C_2 + 2C_5 Z_L g_m + C_5}$
Qz: None
Wz: None

8.2 INVALID-NUMER-2 $Z(s) = \left(\infty,\ \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1}\right)$

$$H(s) = \frac{R_5 Z_L g_m - Z_L + s\left(C_2 R_5 Z_L - C_5 R_5 Z_L\right)}{4C_2 C_5 R_5 Z_L s^2 + R_5 g_m + 2Z_L g_m + s\left(C_2 R_5 + 4C_2 Z_L + 2C_5 R_5 Z_L g_m + C_5 R_5\right) + 1}$$

Parameters:

Q: $\frac{2C_2 C_5 R_5 Z_L \sqrt{\frac{g_m}{C_2 C_5 Z_L} + \frac{2g_m}{C_2 C_5 R_5} + \frac{1}{C_2 C_5 R_5 Z_L}}}{C_2 R_5 + 4C_2 Z_L + 2C_5 R_5 Z_L g_m + C_5 R_5}$
wo: $\frac{\sqrt{\frac{R_5 g_m + 2Z_L g_m + 1}{C_2 C_5 R_5 Z_L}}}{2}$
bandwidth: $\frac{\sqrt{\frac{R_5 g_m + 2Z_L g_m + 1}{C_2 C_5 R_5 Z_L}}\left(C_2 R_5 + 4C_2 Z_L + 2C_5 R_5 Z_L g_m + C_5 R_5\right)}{4C_2 C_5 R_5 Z_L \sqrt{\frac{g_m}{C_2 C_5 Z_L} + \frac{2g_m}{C_2 C_5 R_5} + \frac{1}{C_2 C_5 R_5 Z_L}}}$
K-LP: $\frac{R_5 Z_L g_m - Z_L}{R_5 g_m + 2Z_L g_m + 1}$
K-HP: 0
K-BP: $\frac{C_2 R_5 Z_L - C_5 R_5 Z_L}{C_2 R_5 + 4C_2 Z_L + 2C_5 R_5 Z_L g_m + C_5 R_5}$
Qz: None
Wz: None

8.3 INVALID-NUMER-3 $Z(s) = \left(\infty,\ \frac{R_2}{C_2 R_2 s+1},\ \infty,\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{R_2 Z_L g_m + Z_L + s\left(C_2 R_2 Z_L - C_5 R_2 Z_L\right)}{4C_2 C_5 R_2 Z_L s^2 + R_2 g_m + s\left(C_2 R_2 + 2C_5 R_2 Z_L g_m + C_5 R_2 + 4C_5 Z_L\right) + 1}$$

Parameters:

Q: $\frac{2C_2 C_5 R_2 Z_L \sqrt{\frac{g_m}{C_2 C_5 Z_L} + \frac{1}{C_2 C_5 R_2 Z_L}}}{C_2 R_2 + 2C_5 R_2 Z_L g_m + C_5 R_2 + 4C_5 Z_L}$
wo: $\frac{\sqrt{\frac{R_2 g_m + 1}{C_2 C_5 R_2 Z_L}}}{2}$
bandwidth: $\frac{\sqrt{\frac{R_2 g_m + 1}{C_2 C_5 R_2 Z_L}}\left(C_2 R_2 + 2C_5 R_2 Z_L g_m + C_5 R_2 + 4C_5 Z_L\right)}{4C_2 C_5 R_2 Z_L \sqrt{\frac{g_m}{C_2 C_5 Z_L} + \frac{1}{C_2 C_5 R_2 Z_L}}}$
K-LP: Z_L
K-HP: 0
K-BP: $\frac{C_2 R_2 Z_L - C_5 R_2 Z_L}{C_2 R_2 + 2C_5 R_2 Z_L g_m + C_5 R_2 + 4C_5 Z_L}$
Qz: None
Wz: None

8.4 INVALID-NUMER-4 $Z(s) = \left(\infty,\ \frac{R_2}{C_2 R_2 s+1},\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1}\right)$

$$H(s) = \frac{R_2 R_5 Z_L g_m - R_2 Z_L + R_5 Z_L + s\left(C_2 R_2 R_5 Z_L - C_5 R_2 R_5 Z_L\right)}{4C_2 C_5 R_2 R_5 Z_L s^2 + R_2 R_5 g_m + 2R_2 Z_L g_m + R_2 + R_5 + 4Z_L + s\left(C_2 R_2 R_5 + 4C_2 R_2 Z_L + 2C_5 R_2 R_5 Z_L g_m + C_5 R_2 R_5 + 4C_5 R_5 Z_L\right)}$$

Parameters:

Q: $\frac{2C_2 C_5 R_2 R_5 Z_L \sqrt{\frac{g_m}{C_2 C_5 Z_L} + \frac{2g_m}{C_2 C_5 R_5} + \frac{1}{C_2 C_5 R_5 Z_L} + \frac{1}{C_2 C_5 R_2 Z_L} + \frac{4}{C_2 C_5 R_2 R_5}}}{C_2 R_2 R_5 + 4C_2 R_2 Z_L + 2C_5 R_2 R_5 Z_L g_m + C_5 R_2 R_5 + 4C_5 R_5 Z_L}$
wo: $\frac{\sqrt{\frac{R_2 R_5 g_m + 2R_2 Z_L g_m + R_2 + R_5 + 4Z_L}{C_2 C_5 R_2 R_5 Z_L}}}{2}$
bandwidth: $\frac{\sqrt{\frac{R_2 R_5 g_m + 2R_2 Z_L g_m + R_2 + R_5 + 4Z_L}{C_2 C_5 R_2 R_5 Z_L}}\left(C_2 R_2 R_5 + 4C_2 R_2 Z_L + 2C_5 R_2 R_5 Z_L g_m + C_5 R_2 R_5 + 4C_5 R_5 Z_L\right)}{4C_2 C_5 R_2 R_5 Z_L \sqrt{\frac{g_m}{C_2 C_5 Z_L} + \frac{2g_m}{C_2 C_5 R_5} + \frac{1}{C_2 C_5 R_5 Z_L} + \frac{1}{C_2 C_5 R_2 Z_L} + \frac{4}{C_2 C_5 R_2 R_5}}}$
K-LP: $\frac{R_2 R_5 Z_L g_m - R_2 Z_L + R_5 Z_L}{R_2 R_5 g_m + 2R_2 Z_L g_m + R_2 + R_5 + 4Z_L}$
K-HP: 0
K-BP: $\frac{C_2 R_2 R_5 Z_L - C_5 R_2 R_5 Z_L}{C_2 R_2 R_5 + 4C_2 R_2 Z_L + 2C_5 R_2 R_5 Z_L g_m + C_5 R_2 R_5 + 4C_5 R_5 Z_L}$
Qz: None
Wz: None

9 INVALID-WZ

9.1 INVALID-WZ-1 $Z(s) = \left(\infty,\ \frac{1}{C_2 s},\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_2 C_5 R_5 Z_L s^2 + Z_L g_m + s\left(C_2 Z_L + C_5 R_5 Z_L g_m - C_5 Z_L\right)}{g_m + s^2\left(C_2 C_5 R_5 + 4 C_2 C_5 Z_L\right) + s\left(C_2 + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right)}$$

Parameters:

Q: $\frac{C_2 C_5 R_5 \sqrt{\frac{g_m}{C_2 C_5 R_5 + 4 C_2 C_5 Z_L}} + 4 C_2 C_5 Z_L \sqrt{\frac{g_m}{C_2 C_5 R_5 + 4 C_2 C_5 Z_L}}}{C_2 + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5}$

wo: $\sqrt{\frac{g_m}{C_2 C_5 R_5 + 4 C_2 C_5 Z_L}}$

bandwidth: $\frac{\sqrt{\frac{g_m}{C_2 C_5 R_5 + 4 C_2 C_5 Z_L}}\left(C_2 + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right)}{C_2 C_5 R_5 \sqrt{\frac{g_m}{C_2 C_5 R_5 + 4 C_2 C_5 Z_L}} + 4 C_2 C_5 Z_L \sqrt{\frac{g_m}{C_2 C_5 R_5 + 4 C_2 C_5 Z_L}}}$

K-LP: Z_L

K-HP: $\frac{R_5 Z_L}{R_5 + 4 Z_L}$

K-BP: $\frac{C_2 Z_L + C_5 R_5 Z_L g_m - C_5 Z_L}{C_2 + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5}$

Qz: None

Wz: $\sqrt{\frac{g_m}{C_2 C_5 R_5}}$

9.2 INVALID-WZ-2 $Z(s) = \left(\infty,\ \frac{R_2}{C_2 R_2 s + 1},\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_2 C_5 R_2 R_5 Z_L s^2 + R_2 Z_L g_m + Z_L + s\left(C_2 R_2 Z_L + C_5 R_2 R_5 Z_L g_m - C_5 R_2 Z_L + C_5 R_5 Z_L\right)}{R_2 g_m + s^2\left(C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L\right) + s\left(C_2 R_2 + C_5 R_2 R_5 g_m + 2 C_5 R_2 Z_L g_m + C_5 R_2 + C_5 R_5 + 4 C_5 Z_L\right) + 1}$$

Parameters:

Q: $\frac{C_2 C_5 R_2 R_5 \sqrt{\frac{R_2 g_m}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}} + 4 C_2 C_5 R_2 Z_L \sqrt{\frac{R_2 g_m}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}}}{C_2 R_2 + C_5 R_2 R_5 g_m + 2 C_5 R_2 Z_L g_m + C_5 R_2 + C_5 R_5 + 4 C_5 Z_L}$

wo: $\sqrt{\frac{R_2 g_m + 1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}}$

bandwidth: $\frac{\sqrt{\frac{R_2 g_m + 1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}}\left(C_2 R_2 + C_5 R_2 R_5 g_m + 2 C_5 R_2 Z_L g_m + C_5 R_2 + C_5 R_5 + 4 C_5 Z_L\right)}{C_2 C_5 R_2 R_5 \sqrt{\frac{R_2 g_m}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}} + 4 C_2 C_5 R_2 Z_L \sqrt{\frac{R_2 g_m}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}}}$

K-LP: Z_L

K-HP: $\frac{R_5 Z_L}{R_5 + 4 Z_L}$

K-BP: $\frac{C_2 R_2 Z_L \sqrt{\frac{g_m}{C_2 C_5 R_5 + 4 C_2 C_5 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}} + C_5 R_2 R_5 Z_L g_m \sqrt{\frac{g_m}{C_2 C_5 R_5 + 4 C_2 C_5 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}} - C_5 R_2 Z_L \sqrt{\frac{g_m}{C_2 C_5 R_5 + 4 C_2 C_5 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}} + C_5 R_5 Z_L \sqrt{\frac{g_m}{C_2 C_5 R_5 + 4 C_2 C_5 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}}}{C_2 R_2 \sqrt{\frac{R_2 g_m}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}} + C_5 R_2 R_5 g_m \sqrt{\frac{R_2 g_m}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}} + 2 C_5 R_2 Z_L g_m \sqrt{\frac{R_2 g_m}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}} + C_5 R_2 \sqrt{\frac{R_2 g_m}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}} + C_5 R_5 \sqrt{\frac{R_2 g_m}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L} + \frac{1}{C_2 C_5 R_2 R_5 + 4 C_2 C_5 R_2 Z_L}} + 4 C_5 Z_L \sqrt{}$

Qz: None

Wz: $\sqrt{\frac{R_2 g_m + 1}{C_2 C_5 R_2 R_5}}$

9.3 INVALID-WZ-3 $Z(s) = \left(\infty,\ R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_2 C_5 R_2 Z_L s^2 + Z_L g_m + s\left(C_2 R_2 Z_L g_m + C_2 Z_L - C_5 Z_L\right)}{g_m + s^2\left(2 C_2 C_5 R_2 Z_L g_m + C_2 C_5 R_2 + 4 C_2 C_5 Z_L\right) + s\left(C_2 R_2 g_m + C_2 + 2 C_5 Z_L g_m + C_5\right)}$$

Parameters:

Q: $\frac{2 C_2 C_5 R_2 Z_L g_m \sqrt{\frac{g_m}{2 C_2 C_5 R_2 Z_L g_m + C_2 C_5 R_2 + 4 C_2 C_5 Z_L}} + C_2 C_5 R_2 \sqrt{\frac{g_m}{2 C_2 C_5 R_2 Z_L g_m + C_2 C_5 R_2 + 4 C_2 C_5 Z_L}} + 4 C_2 C_5 Z_L \sqrt{\frac{g_m}{2 C_2 C_5 R_2 Z_L g_m + C_2 C_5 R_2 + 4 C_2 C_5 Z_L}}}{C_2 R_2 g_m + C_2 + 2 C_5 Z_L g_m + C_5}$

wo: $\sqrt{\frac{g_m}{2 C_2 C_5 R_2 Z_L g_m + C_2 C_5 R_2 + 4 C_2 C_5 Z_L}}$

bandwidth: $\frac{\sqrt{\frac{g_m}{2 C_2 C_5 R_2 Z_L g_m + C_2 C_5 R_2 + 4 C_2 C_5 Z_L}}\left(C_2 R_2 g_m + C_2 + 2 C_5 Z_L g_m + C_5\right)}{2 C_2 C_5 R_2 Z_L g_m \sqrt{\frac{g_m}{2 C_2 C_5 R_2 Z_L g_m + C_2 C_5 R_2 + 4 C_2 C_5 Z_L}} + C_2 C_5 R_2 \sqrt{\frac{g_m}{2 C_2 C_5 R_2 Z_L g_m + C_2 C_5 R_2 + 4 C_2 C_5 Z_L}} + 4 C_2 C_5 Z_L \sqrt{\frac{g_m}{2 C_2 C_5 R_2 Z_L g_m + C_2 C_5 R_2 + 4 C_2 C_5 Z_L}}}$

K-LP: Z_L

K-HP: $-\frac{R_2 Z_L}{2 R_2 Z_L g_m + R_2 + 4 Z_L}$

K-BP: $\frac{C_2 R_2 Z_L g_m + C_2 Z_L - C_5 Z_L}{C_2 R_2 g_m + C_2 + 2 C_5 Z_L g_m + C_5}$

Qz: None

Wz: $\sqrt{-\frac{g_m}{C_2 C_5 R_2}}$

9.4 INVALID-WZ-4 $Z(s) = \left(\infty,\ R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1}\right)$

$$H(s) = \frac{-C_2C_5R_2R_5Z_Ls^2 + R_5Z_Lg_m - Z_L + s\left(C_2R_2R_5Z_Lg_m - C_2R_2Z_L + C_2R_5Z_L - C_5R_5Z_L\right)}{R_5g_m + 2Z_Lg_m + s^2\left(2C_2C_5R_2R_5Z_Lg_m + C_2C_5R_2R_5 + 4C_2C_5R_5Z_L\right) + s\left(C_2R_2R_5g_m + 2C_2R_2Z_Lg_m + C_2R_2 + C_2R_5 + 4C_2Z_L + 2C_5R_5Z_Lg_m + C_5R_5\right) + 1}$$

Parameters:

Q: $\frac{2C_2C_5R_2R_5Z_Lg_m\sqrt{\frac{R_5g_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{1}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}}+C_2C_5R_2R_5\sqrt{\frac{R_5g_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{1}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}}+4C_2C_5R_5Z_L\sqrt{2C_2C_5R_2}}{C_2R_2R_5g_m+2C_2R_2Z_Lg_m+C_2R_2+C_2R_5+4C_2Z_L+2C_5R_5Z_Lg_m+C_5R_5}$

wo: $\sqrt{\frac{R_5g_m+2Z_Lg_m+1}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}}$

bandwidth: $\frac{\sqrt{\frac{R_5g_m+2Z_Lg_m+1}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}}\left(C_2R_2R_5g_m+2C_2R_2Z_Lg_m+C_2R_2+C_2R_5+4C_2Z_L+2C_5R_5Z_Lg_m+C_5R_5\right)}{2C_2C_5R_2R_5Z_Lg_m\sqrt{\frac{R_5g_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{1}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}}+C_2C_5R_2R_5\sqrt{\frac{R_5g_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{1}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}}+4C_2C_5R_5Z_L$

K-LP: $\frac{R_5Z_Lg_m-Z_L}{R_5g_m+2Z_Lg_m+1}$

K-HP: $-\frac{R_2Z_L}{2R_2Z_Lg_m+R_2+4Z_L}$

K-BP: $\frac{C_2R_2R_5Z_Lg_m\sqrt{\frac{2Z_Lg_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{g_m}{2C_2C_5R_2Z_Lg_m+C_2C_5R_2+4C_2C_5}}}{C_2R_2R_5g_m\sqrt{\frac{R_5g_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{1}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}}+2C_2R_2Z_Lg_m\sqrt{\frac{R_5g_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}+\frac{1}{2C_2C_5R_2R_5Z_Lg_m+C_2C_5R_2R_5+4C_2C_5R_5Z_L}}+C_2R_2\sqrt{\frac{}{2C_2C_5R_2R_5Z_Lg_m}}$

Qz: None

Wz: $\sqrt{\frac{-R_5g_m+1}{C_2C_5R_2R_5}}$

9.5 INVALID-WZ-5 $Z(s) = \left(\infty,\ R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{Z_Lg_m + s^2\left(C_2C_5R_2R_5Z_Lg_m - C_2C_5R_2Z_L + C_2C_5R_5Z_L\right) + s\left(C_2R_2Z_Lg_m + C_2Z_L + C_5R_5Z_Lg_m - C_5Z_L\right)}{g_m + s^2\left(C_2C_5R_2R_5g_m + 2C_2C_5R_2Z_Lg_m + C_2C_5R_2 + C_2C_5R_5 + 4C_2C_5Z_L\right) + s\left(C_2R_2g_m + C_2 + C_5R_5g_m + 2C_5Z_Lg_m + C_5\right)}$$

Parameters:

Q: $\frac{C_2C_5R_2R_5g_m\sqrt{\frac{g_m}{C_2C_5R_2R_5g_m+2C_2C_5R_2Z_Lg_m+C_2C_5R_2+C_2C_5R_5+4C_2C_5Z_L}}+2C_2C_5R_2Z_Lg_m\sqrt{\frac{g_m}{C_2C_5R_2R_5g_m+2C_2C_5R_2Z_Lg_m+C_2C_5R_2+C_2C_5R_5+4C_2C_5Z_L}}+C_2C_5R_2\sqrt{\frac{g_m}{C_2C_5R_2R_5g_m+2C_2C_5R_2Z_Lg_m+C_2C_5R_2+C_2C_5R_5+4C_2C_5Z_L}}+C_2C_5R_5\sqrt{\frac{g_m}{C_2C_5R_2R_5g_m+2C_2C_5R_2Z_Lg_m+C_2C_5R_2+C_2C_5R_5+4C_2C_5Z_L}}+4C_2C_5Z_L\sqrt{\frac{C_2C_5R_2R_5g_m+}{}}$

wo: $\sqrt{\frac{g_m}{C_2C_5R_2R_5g_m+2C_2C_5R_2Z_Lg_m+C_2C_5R_2+C_2C_5R_5+4C_2C_5Z_L}}$

bandwidth: $\frac{\sqrt{\frac{g_m}{C_2C_5R_2R_5g_m+2C_2C_5R_2Z_Lg_m+C_2C_5R_2+C_2C_5R_5+4C_2C_5Z_L}}\left(C_2R_2g_m+C_2+C_5R_5g_m+2C_5Z_Lg_m+C_5\right)}{C_2C_5R_2R_5g_m\sqrt{\frac{g_m}{C_2C_5R_2R_5g_m+2C_2C_5R_2Z_Lg_m+C_2C_5R_2+C_2C_5R_5+4C_2C_5Z_L}}+2C_2C_5R_2Z_Lg_m\sqrt{\frac{g_m}{C_2C_5R_2R_5g_m+2C_2C_5R_2Z_Lg_m+C_2C_5R_2+C_2C_5R_5+4C_2C_5Z_L}}+C_2C_5R_2\sqrt{\frac{g_m}{C_2C_5R_2R_5g_m+2C_2C_5R_2Z_Lg_m+C_2C_5R_2+C_2C_5R_5+4C_2C_5Z_L}}+C_2C_5R_5\sqrt{\frac{g_m}{C_2C_5R_2R_5g_m+2C_2C_5R_2Z_Lg_m+C_2C_5R_2+C_2C_5R_5+4C_2C_5Z_L}}+4C_2C_5Z_L\sqrt{\frac{}{}}$

K-LP: Z_L

K-HP: $\frac{R_2R_5Z_Lg_m-R_2Z_L+R_5Z_L}{R_2R_5g_m+2R_2Z_Lg_m+R_2+R_5+4Z_L}$

K-BP: $\frac{C_2R_2Z_Lg_m+C_2Z_L+C_5R_5Z_Lg_m-C_5Z_L}{C_2R_2g_m+C_2+C_5R_5g_m+2C_5Z_Lg_m+C_5}$

Qz: None

Wz: $\sqrt{\frac{g_m}{C_2C_5R_2R_5g_m-C_2C_5R_2+C_2C_5R_5}}$

10 INVALID-ORDER

10.1 INVALID-ORDER-1 $Z(s) = (\infty,\ R_2,\ \infty,\ \infty,\ R_5)$

$$H(s) = \frac{R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L}$$

10.2 INVALID-ORDER-2 $Z(s) = \left(\infty,\ R_2,\ \infty,\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_5R_2Z_Ls + R_2Z_Lg_m + Z_L}{R_2g_m + s\left(2C_5R_2Z_Lg_m + C_5R_2 + 4C_5Z_L\right) + 1}$$

10.3 INVALID-ORDER-3 $Z(s) = \left(\infty,\ R_2,\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s+1}\right)$

$$H(s) = \frac{-C_5R_2R_5Z_Ls + R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s\left(2C_5R_2R_5Z_Lg_m + C_5R_2R_5 + 4C_5R_5Z_L\right)}$$

10.4 INVALID-ORDER-4 $Z(s) = \left(\infty,\ R_2,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{R_2 Z_L g_m + Z_L + s\left(C_5 R_2 R_5 Z_L g_m - C_5 R_2 Z_L + C_5 R_5 Z_L\right)}{R_2 g_m + s\left(C_5 R_2 R_5 g_m + 2C_5 R_2 Z_L g_m + C_5 R_2 + C_5 R_5 + 4C_5 Z_L\right) + 1}$$

10.5 INVALID-ORDER-5 $Z(s) = \left(\infty,\ \frac{1}{C_2 s},\ \infty,\ \infty,\ R_5\right)$

$$H(s) = \frac{C_2 R_5 Z_L s + R_5 Z_L g_m - Z_L}{R_5 g_m + 2Z_L g_m + s\left(C_2 R_5 + 4C_2 Z_L\right) + 1}$$

10.6 INVALID-ORDER-6 $Z(s) = \left(\infty,\ \frac{1}{C_2 s},\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_2 C_5 L_5 Z_L s^3 + C_5 L_5 Z_L g_m s^2 + Z_L g_m + s\left(C_2 Z_L - C_5 Z_L\right)}{C_2 C_5 L_5 s^3 + g_m + s^2\left(4C_2 C_5 Z_L + C_5 L_5 g_m\right) + s\left(C_2 + 2C_5 Z_L g_m + C_5\right)}$$

10.7 INVALID-ORDER-7 $Z(s) = \left(\infty,\ \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{L_5 Z_L g_m s - Z_L + s^2\left(C_2 L_5 Z_L - C_5 L_5 Z_L\right)}{4C_2 C_5 L_5 Z_L s^3 + 2Z_L g_m + s^2\left(C_2 L_5 + 2C_5 L_5 Z_L g_m + C_5 L_5\right) + s\left(4C_2 Z_L + L_5 g_m\right) + 1}$$

10.8 INVALID-ORDER-8 $Z(s) = \left(\infty,\ \frac{1}{C_2 s},\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_2 C_5 L_5 Z_L s^3 + Z_L g_m + s^2\left(C_2 C_5 R_5 Z_L + C_5 L_5 Z_L g_m\right) + s\left(C_2 Z_L + C_5 R_5 Z_L g_m - C_5 Z_L\right)}{C_2 C_5 L_5 s^3 + g_m + s^2\left(C_2 C_5 R_5 + 4C_2 C_5 Z_L + C_5 L_5 g_m\right) + s\left(C_2 + C_5 R_5 g_m + 2C_5 Z_L g_m + C_5\right)}$$

10.9 INVALID-ORDER-9 $Z(s) = \left(\infty,\ \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5}\right)$

$$H(s) = \frac{-R_5 Z_L + s^2\left(C_2 L_5 R_5 Z_L - C_5 L_5 R_5 Z_L\right) + s\left(L_5 R_5 Z_L g_m - L_5 Z_L\right)}{4C_2 C_5 L_5 R_5 Z_L s^3 + 2R_5 Z_L g_m + R_5 + s^2\left(C_2 L_5 R_5 + 4C_2 L_5 Z_L + 2C_5 L_5 R_5 Z_L g_m + C_5 L_5 R_5\right) + s\left(4C_2 R_5 Z_L + L_5 R_5 g_m + 2L_5 Z_L g_m + L_5\right)}$$

10.10 INVALID-ORDER-10 $Z(s) = \left(\infty,\ \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{C_5 L_5 R_5 s^2 + L_5 s + R_5}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{C_2 C_5 L_5 R_5 Z_L s^3 + R_5 Z_L g_m - Z_L + s^2\left(C_2 L_5 Z_L + C_5 L_5 R_5 Z_L g_m - C_5 L_5 Z_L\right) + s\left(C_2 R_5 Z_L + L_5 Z_L g_m\right)}{R_5 g_m + 2Z_L g_m + s^3\left(C_2 C_5 L_5 R_5 + 4C_2 C_5 L_5 Z_L\right) + s^2\left(C_2 L_5 + C_5 L_5 R_5 g_m + 2C_5 L_5 Z_L g_m + C_5 L_5\right) + s\left(C_2 R_5 + 4C_2 Z_L + L_5 g_m\right) + 1}$$

10.11 INVALID-ORDER-11 $Z(s) = \left(\infty,\ \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2 + 1\right)}{C_5 L_5 s^2 + C_5 R_5 s + 1}\right)$

$$H(s) = \frac{C_2 C_5 L_5 R_5 Z_L s^3 + R_5 Z_L g_m - Z_L + s^2\left(C_5 L_5 R_5 Z_L g_m - C_5 L_5 Z_L\right) + s\left(C_2 R_5 Z_L - C_5 R_5 Z_L\right)}{R_5 g_m + 2Z_L g_m + s^3\left(C_2 C_5 L_5 R_5 + 4C_2 C_5 L_5 Z_L\right) + s^2\left(4C_2 C_5 R_5 Z_L + C_5 L_5 R_5 g_m + 2C_5 L_5 Z_L g_m + C_5 L_5\right) + s\left(C_2 R_5 + 4C_2 Z_L + 2C_5 R_5 Z_L g_m + C_5 R_5\right) + 1}$$

10.12 INVALID-ORDER-12 $Z(s) = \left(\infty,\ \frac{R_2}{C_2 R_2 s + 1},\ \infty,\ \infty,\ R_5\right)$

$$H(s) = \frac{C_2 R_2 R_5 Z_L s + R_2 R_5 Z_L g_m - R_2 Z_L + R_5 Z_L}{R_2 R_5 g_m + 2R_2 Z_L g_m + R_2 + R_5 + 4Z_L + s\left(C_2 R_2 R_5 + 4C_2 R_2 Z_L\right)}$$

10.13 INVALID-ORDER-13 $Z(s) = \left(\infty,\ \frac{R_2}{C_2 R_2 s + 1},\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_2 C_5 L_5 R_2 Z_L s^3 + R_2 Z_L g_m + Z_L + s^2\left(C_5 L_5 R_2 Z_L g_m + C_5 L_5 Z_L\right) + s\left(C_2 R_2 Z_L - C_5 R_2 Z_L\right)}{C_2 C_5 L_5 R_2 s^3 + R_2 g_m + s^2\left(4C_2 C_5 R_2 Z_L + C_5 L_5 R_2 g_m + C_5 L_5\right) + s\left(C_2 R_2 + 2C_5 R_2 Z_L g_m + C_5 R_2 + 4C_5 Z_L\right) + 1}$$

10.14 INVALID-ORDER-14 $Z(s) = \left(\infty,\ \frac{R_2}{C_2R_2s+1},\ \infty,\ \infty,\ \frac{L_5s}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{-R_2Z_L + s^2\left(C_2L_5R_2Z_L - C_5L_5R_2Z_L\right) + s\left(L_5R_2Z_Lg_m + L_5Z_L\right)}{4C_2C_5L_5R_2Z_Ls^3 + 2R_2Z_Lg_m + R_2 + 4Z_L + s^2\left(C_2L_5R_2 + 2C_5L_5R_2Z_Lg_m + C_5L_5R_2 + 4C_5L_5Z_L\right) + s\left(4C_2R_2Z_L + L_5R_2g_m + L_5\right)}$$

10.15 INVALID-ORDER-15 $Z(s) = \left(\infty,\ \frac{R_2}{C_2R_2s+1},\ \infty,\ \infty,\ L_5s + R_5 + \frac{1}{C_5s}\right)$

$$H(s) = \frac{C_2C_5L_5R_2Z_Ls^3 + R_2Z_Lg_m + Z_L + s^2\left(C_2C_5R_2R_5Z_L + C_5L_5R_2Z_Lg_m + C_5L_5Z_L\right) + s\left(C_2R_2Z_L + C_5R_2R_5Z_Lg_m - C_5R_2Z_L + C_5R_5Z_L\right)}{C_2C_5L_5R_2s^3 + R_2g_m + s^2\left(C_2C_5R_2R_5 + 4C_2C_5R_2Z_L + C_5L_5R_2g_m + C_5L_5\right) + s\left(C_2R_2 + C_5R_2R_5g_m + 2C_5R_2Z_Lg_m + C_5R_2 + C_5R_5 + 4C_5Z_L\right) + 1}$$

10.16 INVALID-ORDER-16 $Z(s) = \left(\infty,\ \frac{R_2}{C_2R_2s+1},\ \infty,\ \infty,\ \frac{L_5R_5s}{C_5L_5R_5s^2+L_5s+R_5}\right)$

$$H(s) = \frac{-R_2R_5Z_L + s^2\left(C_2L_5R_2R_5Z_L - C_5L_5R_2R_5Z_L\right) + s\left(L_5R_2R_5Z_Lg_m - L_5R_2Z_L + L_5R_5Z_L\right)}{4C_2C_5L_5R_2R_5Z_Ls^3 + 2R_2R_5Z_Lg_m + R_2R_5 + 4R_5Z_L + s^2\left(C_2L_5R_2R_5 + 4C_2L_5R_2Z_L + 2C_5L_5R_2R_5Z_Lg_m + C_5L_5R_2R_5 + 4C_5L_5R_5Z_L\right) + s\left(4C_2R_2R_5Z_L + L_5R_2R_5g_m + 2L_5R_2Z_Lg_m + L_5R_2 + L_5R_5 + 4L_5Z_L\right)}$$

10.17 INVALID-ORDER-17 $Z(s) = \left(\infty,\ \frac{R_2}{C_2R_2s+1},\ \infty,\ \infty,\ \frac{C_5L_5R_5s^2+L_5s+R_5}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{C_2C_5L_5R_2R_5Z_Ls^3 + R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L + s^2\left(C_2L_5R_2Z_L + C_5L_5R_2R_5Z_Lg_m - C_5L_5R_2Z_L + C_5L_5R_5Z_L\right) + s\left(C_2R_2R_5Z_L + L_5R_2Z_Lg_m + L_5Z_L\right)}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s^3\left(C_2C_5L_5R_2R_5 + 4C_2C_5L_5R_2Z_L\right) + s^2\left(C_2L_5R_2 + C_5L_5R_2R_5g_m + 2C_5L_5R_2Z_Lg_m + C_5L_5R_2 + C_5L_5R_5 + 4C_5L_5Z_L\right) + s\left(C_2R_2R_5 + 4C_2R_2Z_L + L_5R_2g_m + L_5\right)}$$

10.18 INVALID-ORDER-18 $Z(s) = \left(\infty,\ \frac{R_2}{C_2R_2s+1},\ \infty,\ \infty,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1}\right)$

$$H(s) = \frac{C_2C_5L_5R_2R_5Z_Ls^3 + R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L + s^2\left(C_5L_5R_2R_5Z_Lg_m - C_5L_5R_2Z_L + C_5L_5R_5Z_L\right) + s\left(C_2R_2R_5Z_L - C_5R_2R_5Z_L\right)}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s^3\left(C_2C_5L_5R_2R_5 + 4C_2C_5L_5R_2Z_L\right) + s^2\left(4C_2C_5R_2R_5Z_L + C_5L_5R_2R_5g_m + 2C_5L_5R_2Z_Lg_m + C_5L_5R_2 + C_5L_5R_5 + 4C_5L_5Z_L\right) + s\left(C_2R_2R_5 + 4C_2R_2Z_L + 2C_5R_2R_5Z_Lg_m + C_5R_2R_5 + 4C_5R_5Z_L\right)}$$

10.19 INVALID-ORDER-19 $Z(s) = \left(\infty,\ R_2 + \frac{1}{C_2s},\ \infty,\ \infty,\ R_5\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s\left(C_2R_2R_5Z_Lg_m - C_2R_2Z_L + C_2R_5Z_L\right)}{R_5g_m + 2Z_Lg_m + s\left(C_2R_2R_5g_m + 2C_2R_2Z_Lg_m + C_2R_2 + C_2R_5 + 4C_2Z_L\right) + 1}$$

10.20 INVALID-ORDER-20 $Z(s) = \left(\infty,\ R_2 + \frac{1}{C_2s},\ \infty,\ \infty,\ L_5s + \frac{1}{C_5s}\right)$

$$H(s) = \frac{Z_Lg_m + s^3\left(C_2C_5L_5R_2Z_Lg_m + C_2C_5L_5Z_L\right) + s^2\left(-C_2C_5R_2Z_L + C_5L_5Z_Lg_m\right) + s\left(C_2R_2Z_Lg_m + C_2Z_L - C_5Z_L\right)}{g_m + s^3\left(C_2C_5L_5R_2g_m + C_2C_5L_5\right) + s^2\left(2C_2C_5R_2Z_Lg_m + C_2C_5R_2 + 4C_2C_5Z_L + C_5L_5g_m\right) + s\left(C_2R_2g_m + C_2 + 2C_5Z_Lg_m + C_5\right)}$$

10.21 INVALID-ORDER-21 $Z(s) = \left(\infty,\ R_2 + \frac{1}{C_2s},\ \infty,\ \infty,\ \frac{L_5s}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{-C_2C_5L_5R_2Z_Ls^3 - Z_L + s^2\left(C_2L_5R_2Z_Lg_m + C_2L_5Z_L - C_5L_5Z_L\right) + s\left(-C_2R_2Z_L + L_5Z_Lg_m\right)}{2Z_Lg_m + s^3\left(2C_2C_5L_5R_2Z_Lg_m + C_2C_5L_5R_2 + 4C_2C_5L_5Z_L\right) + s^2\left(C_2L_5R_2g_m + C_2L_5 + 2C_5L_5Z_Lg_m + C_5L_5\right) + s\left(2C_2R_2Z_Lg_m + C_2R_2 + 4C_2Z_L + L_5g_m\right) + 1}$$

10.22 INVALID-ORDER-22 $Z(s) = \left(\infty,\ R_2 + \frac{1}{C_2s},\ \infty,\ \infty,\ L_5s + R_5 + \frac{1}{C_5s}\right)$

$$H(s) = \frac{Z_Lg_m + s^3\left(C_2C_5L_5R_2Z_Lg_m + C_2C_5L_5Z_L\right) + s^2\left(C_2C_5R_2R_5Z_Lg_m - C_2C_5R_2Z_L + C_2C_5R_5Z_L + C_5L_5Z_Lg_m\right) + s\left(C_2R_2Z_Lg_m + C_2Z_L + C_5R_5Z_Lg_m - C_5Z_L\right)}{g_m + s^3\left(C_2C_5L_5R_2g_m + C_2C_5L_5\right) + s^2\left(C_2C_5R_2R_5g_m + 2C_2C_5R_2Z_Lg_m + C_2C_5R_2 + C_2C_5R_5 + 4C_2C_5Z_L + C_5L_5g_m\right) + s\left(C_2R_2g_m + C_2 + C_5R_5g_m + 2C_5Z_Lg_m + C_5\right)}$$

10.23 INVALID-ORDER-23 $Z(s) = \left(\infty,\ R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5}\right)$

$$H(s) = \frac{-C_2C_5L_5R_2R_5Z_Ls^3 - R_5Z_L + s^2\left(C_2L_5R_2R_5Z_Lg_m - C_2L_5R_2Z_L + C_2L_5R_5Z_L - C_5L_5R_5Z_L\right) + s\left(-C_2R_2R_5Z_L + L_5R_5Z_Lg_m - L_5Z_L\right)}{2R_5Z_Lg_m + R_5 + s^3\left(2C_2C_5L_5R_2R_5Z_Lg_m + C_2C_5L_5R_2R_5 + 4C_2C_5L_5R_5Z_L\right) + s^2\left(C_2L_5R_2R_5g_m + 2C_2L_5R_2Z_Lg_m + C_2L_5R_2 + C_2L_5R_5 + 4C_2L_5Z_L + 2C_5L_5R_5Z_Lg_m + C_5L_5R_5\right) + s\left(2C_2R_2R_5Z_Lg_m + C_2R_2R_5 + 4C_2R_5Z_L + L_5R_5g_m + 2L_5Z_Lg_m + L_5\right)}$$

10.24 INVALID-ORDER-24 $Z(s) = \left(\infty,\ R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{C_5 L_5 R_5 s^2 + L_5 s + R_5}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s^3\left(C_2C_5L_5R_2R_5Z_Lg_m - C_2C_5L_5R_2Z_L + C_2C_5L_5R_5Z_L\right) + s^2\left(C_2L_5R_2Z_Lg_m + C_2L_5Z_L + C_5L_5R_5Z_Lg_m - C_5L_5Z_L\right) + s\left(C_2R_2R_5Z_Lg_m - C_2R_2Z_L + C_2R_5Z_L + L_5Z_Lg_m\right)}{R_5g_m + 2Z_Lg_m + s^3\left(C_2C_5L_5R_2R_5g_m + 2C_2C_5L_5R_2Z_Lg_m + C_2C_5L_5R_2 + C_2C_5L_5R_5 + 4C_2C_5L_5Z_L\right) + s^2\left(C_2L_5R_2g_m + C_2L_5 + C_5L_5R_5g_m + 2C_5L_5Z_Lg_m + C_5L_5\right) + s\left(C_2R_2R_5g_m + 2C_2R_2Z_Lg_m + C_2R_2 + C_2R_5 + 4C_2Z_L + L_5g_m\right) + 1}$$

10.25 INVALID-ORDER-25 $Z(s) = \left(\infty,\ R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2 + 1\right)}{C_5 L_5 s^2 + C_5 R_5 s + 1}\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s^3\left(C_2C_5L_5R_2R_5Z_Lg_m - C_2C_5L_5R_2Z_L + C_2C_5L_5R_5Z_L\right) + s^2\left(-C_2C_5R_2R_5Z_L + C_5L_5R_5Z_Lg_m - C_5L_5Z_L\right) + s\left(C_2R_2R_5Z_Lg_m - C_2R_2Z_L + C_2R_5Z_L - C_5R_5Z_L\right)}{R_5g_m + 2Z_Lg_m + s^3\left(C_2C_5L_5R_2R_5g_m + 2C_2C_5L_5R_2Z_Lg_m + C_2C_5L_5R_2 + C_2C_5L_5R_5 + 4C_2C_5L_5Z_L\right) + s^2\left(2C_2C_5R_2R_5Z_Lg_m + C_2C_5R_2R_5 + 4C_2C_5R_5Z_L + C_5L_5R_5g_m + 2C_5L_5Z_Lg_m + C_5L_5\right) + s\left(C_2R_2R_5g_m + 2C_2R_2Z_Lg_m + C_2R_2 + C_2R_5 + 4C_2Z_L + 2C_5R_5\right.$$

10.26 INVALID-ORDER-26 $Z(s) = \left(\infty,\ L_2 s + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_2C_5L_2Z_Ls^3 + C_2L_2Z_Lg_ms^2 + Z_Lg_m + s\left(C_2Z_L - C_5Z_L\right)}{g_m + s^3\left(2C_2C_5L_2Z_Lg_m + C_2C_5L_2\right) + s^2\left(4C_2C_5Z_L + C_2L_2g_m\right) + s\left(C_2 + 2C_5Z_Lg_m + C_5\right)}$$

10.27 INVALID-ORDER-27 $Z(s) = \left(\infty,\ L_2 s + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s + 1}\right)$

$$H(s) = \frac{-C_2C_5L_2R_5Z_Ls^3 + R_5Z_Lg_m - Z_L + s^2\left(C_2L_2R_5Z_Lg_m - C_2L_2Z_L\right) + s\left(C_2R_5Z_L - C_5R_5Z_L\right)}{R_5g_m + 2Z_Lg_m + s^3\left(2C_2C_5L_2R_5Z_Lg_m + C_2C_5L_2R_5\right) + s^2\left(4C_2C_5R_5Z_L + C_2L_2R_5g_m + 2C_2L_2Z_Lg_m + C_2L_2\right) + s\left(C_2R_5 + 4C_2Z_L + 2C_5R_5Z_Lg_m + C_5R_5\right) + 1}$$

10.28 INVALID-ORDER-28 $Z(s) = \left(\infty,\ L_2 s + \frac{1}{C_2 s},\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{Z_Lg_m + s^3\left(C_2C_5L_2R_5Z_Lg_m - C_2C_5L_2Z_L\right) + s^2\left(C_2C_5R_5Z_L + C_2L_2Z_Lg_m\right) + s\left(C_2Z_L + C_5R_5Z_Lg_m - C_5Z_L\right)}{g_m + s^3\left(C_2C_5L_2R_5g_m + 2C_2C_5L_2Z_Lg_m + C_2C_5L_2\right) + s^2\left(C_2C_5R_5 + 4C_2C_5Z_L + C_2L_2g_m\right) + s\left(C_2 + C_5R_5g_m + 2C_5Z_Lg_m + C_5\right)}$$

10.29 INVALID-ORDER-29 $Z(s) = \left(\infty,\ L_2 s + \frac{1}{C_2 s},\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_2C_5L_2L_5Z_Lg_ms^4 + Z_Lg_m + s^3\left(-C_2C_5L_2Z_L + C_2C_5L_5Z_L\right) + s^2\left(C_2L_2Z_Lg_m + C_5L_5Z_Lg_m\right) + s\left(C_2Z_L - C_5Z_L\right)}{C_2C_5L_2L_5g_ms^4 + g_m + s^3\left(2C_2C_5L_2Z_Lg_m + C_2C_5L_2 + C_2C_5L_5\right) + s^2\left(4C_2C_5Z_L + C_2L_2g_m + C_5L_5g_m\right) + s\left(C_2 + 2C_5Z_Lg_m + C_5\right)}$$

10.30 INVALID-ORDER-30 $Z(s) = \left(\infty,\ L_2 s + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{-C_2C_5L_2L_5Z_Ls^4 + C_2L_2L_5Z_Lg_ms^3 + L_5Z_Lg_ms - Z_L + s^2\left(-C_2L_2Z_L + C_2L_5Z_L - C_5L_5Z_L\right)}{2Z_Lg_m + s^4\left(2C_2C_5L_2L_5Z_Lg_m + C_2C_5L_2L_5\right) + s^3\left(4C_2C_5L_5Z_L + C_2L_2L_5g_m\right) + s^2\left(2C_2L_2Z_Lg_m + C_2L_2 + C_2L_5 + 2C_5L_5Z_Lg_m + C_5L_5\right) + s\left(4C_2Z_L + L_5g_m\right) + 1}$$

10.31 INVALID-ORDER-31 $Z(s) = \left(\infty,\ L_2 s + \frac{1}{C_2 s},\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_2C_5L_2L_5Z_Lg_ms^4 + Z_Lg_m + s^3\left(C_2C_5L_2R_5Z_Lg_m - C_2C_5L_2Z_L + C_2C_5L_5Z_L\right) + s^2\left(C_2C_5R_5Z_L + C_2L_2Z_Lg_m + C_5L_5Z_Lg_m\right) + s\left(C_2Z_L + C_5R_5Z_Lg_m - C_5Z_L\right)}{C_2C_5L_2L_5g_ms^4 + g_m + s^3\left(C_2C_5L_2R_5g_m + 2C_2C_5L_2Z_Lg_m + C_2C_5L_2 + C_2C_5L_5\right) + s^2\left(C_2C_5R_5 + 4C_2C_5Z_L + C_2L_2g_m + C_5L_5g_m\right) + s\left(C_2 + C_5R_5g_m + 2C_5Z_Lg_m + C_5\right)}$$

10.32 INVALID-ORDER-32 $Z(s) = \left(\infty,\ L_2 s + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5}\right)$

$$H(s) = \frac{-C_2C_5L_2L_5R_5Z_Ls^4 - R_5Z_L + s^3\left(C_2L_2L_5R_5Z_Lg_m - C_2L_2L_5Z_L\right) + s^2\left(-C_2L_2R_5Z_L + C_2L_5R_5Z_L - C_5L_5R_5Z_L\right) + s\left(L_5R_5Z_Lg_m - L_5Z_L\right)}{2R_5Z_Lg_m + R_5 + s^4\left(2C_2C_5L_2L_5R_5Z_Lg_m + C_2C_5L_2L_5R_5\right) + s^3\left(4C_2C_5L_5R_5Z_L + C_2L_2L_5R_5g_m + 2C_2L_2L_5Z_Lg_m + C_2L_2L_5\right) + s^2\left(2C_2L_2R_5Z_Lg_m + C_2L_2R_5 + C_2L_5R_5 + 4C_2L_5Z_L + 2C_5L_5R_5Z_Lg_m + C_5L_5R_5\right) + s\left(4C_2R_5Z_L + L_5R_5g_m + 2L_5Z_Lg_m + L_5\right)}$$

10.33 INVALID-ORDER-33 $Z(s) = \left(\infty,\ L_2 s + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{C_5 L_5 R_5 s^2 + L_5 s + R_5}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s^4\left(C_2C_5L_2L_5R_5Z_Lg_m - C_2C_5L_2L_5Z_L\right) + s^3\left(C_2C_5L_5R_5Z_L + C_2L_2L_5Z_Lg_m\right) + s^2\left(C_2L_2R_5Z_Lg_m - C_2L_2Z_L + C_2L_5Z_L + C_5L_5R_5Z_Lg_m - C_5L_5Z_L\right) + s\left(C_2R_5Z_L + L_5Z_Lg_m\right)}{R_5g_m + 2Z_Lg_m + s^4\left(C_2C_5L_2L_5R_5g_m + 2C_2C_5L_2L_5Z_Lg_m + C_2C_5L_2L_5\right) + s^3\left(C_2C_5L_5R_5 + 4C_2C_5L_5Z_L + C_2L_2L_5g_m\right) + s^2\left(C_2L_2R_5g_m + 2C_2L_2Z_Lg_m + C_2L_2 + C_2L_5 + C_5L_5R_5g_m + 2C_5L_5Z_Lg_m + C_5L_5\right) + s\left(C_2R_5 + 4C_2Z_L + L_5g_m\right) + 1}$$

10.34 INVALID-ORDER-34 $Z(s) = \left(\infty,\ L_2 s + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2 + 1\right)}{C_5 L_5 s^2 + C_5 R_5 s + 1}\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s^4\left(C_2C_5L_2L_5R_5Z_Lg_m - C_2C_5L_2L_5Z_L\right) + s^3\left(-C_2C_5L_2R_5Z_L + C_2C_5L_5R_5Z_L\right) + s^2\left(C_2L_2R_5Z_Lg_m - C_2L_2Z_L + C_5L_5R_5Z_Lg_m - C_5L_5Z_L\right) + s\left(C_2R_5Z_L - C_5R_5Z_L\right)}{R_5g_m + 2Z_Lg_m + s^4\left(C_2C_5L_2L_5R_5g_m + 2C_2C_5L_2L_5Z_Lg_m + C_2C_5L_2L_5\right) + s^3\left(2C_2C_5L_2R_5Z_Lg_m + C_2C_5L_2R_5 + C_2C_5L_5R_5 + 4C_2C_5L_5Z_L\right) + s^2\left(4C_2C_5R_5Z_L + C_2L_2R_5g_m + 2C_2L_2Z_Lg_m + C_2L_2 + C_5L_5R_5g_m + 2C_5L_5Z_Lg_m + C_5L_5\right) + s\left(C_2R_5 + 4C_2Z_L + 2C_5\right.}$$

10.35 INVALID-ORDER-35 $Z(s) = \left(\infty,\ L_2 s + R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_2C_5L_2Z_Ls^3 + Z_Lg_m + s^2\left(-C_2C_5R_2Z_L + C_2L_2Z_Lg_m\right) + s\left(C_2R_2Z_Lg_m + C_2Z_L - C_5Z_L\right)}{g_m + s^3\left(2C_2C_5L_2Z_Lg_m + C_2C_5L_2\right) + s^2\left(2C_2C_5R_2Z_Lg_m + C_2C_5R_2 + 4C_2C_5Z_L + C_2L_2g_m\right) + s\left(C_2R_2g_m + C_2 + 2C_5Z_Lg_m + C_5\right)}$$

10.36 INVALID-ORDER-36 $Z(s) = \left(\infty,\ L_2 s + R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s + 1}\right)$

$$H(s) = \frac{-C_2C_5L_2R_5Z_Ls^3 + R_5Z_Lg_m - Z_L + s^2\left(-C_2C_5R_2R_5Z_L + C_2L_2R_5Z_Lg_m - C_2L_2Z_L\right) + s\left(C_2R_2R_5Z_Lg_m - C_2R_2Z_L + C_2R_5Z_L - C_5R_5Z_L\right)}{R_5g_m + 2Z_Lg_m + s^3\left(2C_2C_5L_2R_5Z_Lg_m + C_2C_5L_2R_5\right) + s^2\left(2C_2C_5R_2R_5Z_Lg_m + C_2C_5R_2R_5 + 4C_2C_5R_5Z_L + C_2L_2R_5g_m + 2C_2L_2Z_Lg_m + C_2L_2\right) + s\left(C_2R_2R_5g_m + 2C_2R_2Z_Lg_m + C_2R_2 + C_2R_5 + 4C_2Z_L + 2C_5R_5Z_Lg_m + C_5R_5\right) + 1}$$

10.37 INVALID-ORDER-37 $Z(s) = \left(\infty,\ L_2 s + R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{Z_Lg_m + s^3\left(C_2C_5L_2R_5Z_Lg_m - C_2C_5L_2Z_L\right) + s^2\left(C_2C_5R_2R_5Z_Lg_m - C_2C_5R_2Z_L + C_2C_5R_5Z_L + C_2L_2Z_Lg_m\right) + s\left(C_2R_2Z_Lg_m + C_2Z_L + C_5R_5Z_Lg_m - C_5Z_L\right)}{g_m + s^3\left(C_2C_5L_2R_5g_m + 2C_2C_5L_2Z_Lg_m + C_2C_5L_2\right) + s^2\left(C_2C_5R_2R_5g_m + 2C_2C_5R_2Z_Lg_m + C_2C_5R_2 + C_2C_5R_5 + 4C_2C_5Z_L + C_2L_2g_m\right) + s\left(C_2R_2g_m + C_2 + C_5R_5g_m + 2C_5Z_Lg_m + C_5\right)}$$

10.38 INVALID-ORDER-38 $Z(s) = \left(\infty,\ L_2 s + R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_2C_5L_2L_5Z_Lg_ms^4 + Z_Lg_m + s^3\left(-C_2C_5L_2Z_L + C_2C_5L_5R_2Z_Lg_m + C_2C_5L_5Z_L\right) + s^2\left(-C_2C_5R_2Z_L + C_2L_2Z_Lg_m + C_5L_5Z_Lg_m\right) + s\left(C_2R_2Z_Lg_m + C_2Z_L - C_5Z_L\right)}{C_2C_5L_2L_5g_ms^4 + g_m + s^3\left(2C_2C_5L_2Z_Lg_m + C_2C_5L_2 + C_2C_5L_5R_2g_m + C_2C_5L_5\right) + s^2\left(2C_2C_5R_2Z_Lg_m + C_2C_5R_2 + 4C_2C_5Z_L + C_2L_2g_m + C_5L_5g_m\right) + s\left(C_2R_2g_m + C_2 + 2C_5Z_Lg_m + C_5\right)}$$

10.39 INVALID-ORDER-39 $Z(s) = \left(\infty,\ L_2 s + R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{-C_2C_5L_2L_5Z_Ls^4 - Z_L + s^3\left(-C_2C_5L_5R_2Z_L + C_2L_2L_5Z_Lg_m\right) + s^2\left(-C_2L_2Z_L + C_2L_5R_2Z_Lg_m + C_2L_5Z_L - C_5L_5Z_L\right) + s\left(-C_2R_2Z_L + L_5Z_Lg_m\right)}{2Z_Lg_m + s^4\left(2C_2C_5L_2L_5Z_Lg_m + C_2C_5L_2L_5\right) + s^3\left(2C_2C_5L_5R_2Z_Lg_m + C_2C_5L_5R_2 + 4C_2C_5L_5Z_L + C_2L_2L_5g_m\right) + s^2\left(2C_2L_2Z_Lg_m + C_2L_2 + C_2L_5R_2g_m + C_2L_5 + 2C_5L_5Z_Lg_m + C_5L_5\right) + s\left(2C_2R_2Z_Lg_m + C_2R_2 + 4C_2Z_L + L_5g_m\right) + 1}$$

10.40 INVALID-ORDER-40 $Z(s) = \left(\infty,\ L_2 s + R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_2C_5L_2L_5Z_Lg_ms^4 + Z_Lg_m + s^3\left(C_2C_5L_2R_5Z_Lg_m - C_2C_5L_2Z_L + C_2C_5L_5R_2Z_Lg_m + C_2C_5L_5Z_L\right) + s^2\left(C_2C_5R_2R_5Z_Lg_m - C_2C_5R_2Z_L + C_2C_5R_5Z_L + C_2L_2Z_Lg_m + C_5L_5Z_Lg_m\right) + s\left(C_2R_2Z_Lg_m + C_2Z_L + C_5R_5Z_Lg_m - C_5Z_L\right)}{C_2C_5L_2L_5g_ms^4 + g_m + s^3\left(C_2C_5L_2R_5g_m + 2C_2C_5L_2Z_Lg_m + C_2C_5L_2 + C_2C_5L_5R_2g_m + C_2C_5L_5\right) + s^2\left(C_2C_5R_2R_5g_m + 2C_2C_5R_2Z_Lg_m + C_2C_5R_2 + C_2C_5R_5 + 4C_2C_5Z_L + C_2L_2g_m + C_5L_5g_m\right) + s\left(C_2R_2g_m + C_2 + C_5R_5g_m + 2C_5Z_Lg_m + C_5\right)}$$

10.41 INVALID-ORDER-41 $Z(s) = \left(\infty,\ L_2 s + R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5}\right)$

$$H(s) = \frac{-C_2C_5L_2L_5R_5Z_Ls^4 - R_5Z_L + s^3\left(-C_2C_5L_5R_2R_5Z_L + C_2L_2L_5R_5Z_Lg_m - C_2L_2L_5Z_L\right) + s^2\left(-C_2L_2R_5Z_L + C_2L_5R_2R_5Z_Lg_m - C_2L_5R_2Z_L + C_2L_5R_5Z_L - C_5L_5R_5Z_L\right) + s\left(-C_2R}{2R_5Z_Lg_m + R_5 + s^4\left(2C_2C_5L_2L_5R_5Z_Lg_m + C_2C_5L_2L_5R_5\right) + s^3\left(2C_2C_5L_5R_2R_5Z_Lg_m + C_2C_5L_5R_2R_5 + 4C_2C_5L_5R_5Z_L + C_2L_2L_5R_5g_m + 2C_2L_2L_5Z_Lg_m + C_2L_2L_5\right) + s^2\left(2C_2L_2R_5Z_Lg_m + C_2L_2R_5 + C_2L_5R_2R_5g_m + 2C_2L_5R_2Z_Lg_m + C_2L_5R_2 + C_2L_5R_5 + 4C\right.$$

10.42 INVALID-ORDER-42 $Z(s) = \left(\infty,\ L_2 s + R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{C_5 L_5 R_5 s^2 + L_5 s + R_5}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s^4\left(C_2C_5L_2L_5R_5Z_Lg_m - C_2C_5L_2L_5Z_L\right) + s^3\left(C_2C_5L_5R_2R_5Z_Lg_m - C_2C_5L_5R_2Z_L + C_2C_5L_5R_5Z_L + C_2L_2L_5Z_Lg_m\right) + s^2\left(C_2L_2R_5Z_Lg_m - C_2L_2Z_L + C_2L_5R_2Z_Lg_m + C_2L_5Z_L + C_5L_5R_5Z_Lg_m - C_5L_5Z_L\right) + s}{R_5g_m + 2Z_Lg_m + s^4\left(C_2C_5L_2L_5R_5g_m + 2C_2C_5L_2L_5Z_Lg_m + C_2C_5L_2L_5\right) + s^3\left(C_2C_5L_5R_2R_5g_m + 2C_2C_5L_5R_2Z_Lg_m + C_2C_5L_5R_2 + C_2C_5L_5R_5 + 4C_2C_5L_5Z_L + C_2L_2L_5g_m\right) + s^2\left(C_2L_2R_5g_m + 2C_2L_2Z_Lg_m + C_2L_2 + C_2L_5R_2g_m + C_2L_5 + C_5L_5R_5g_m + 2C_5L_5Z$$

10.43 INVALID-ORDER-43 $Z(s) = \left(\infty,\ L_2 s + R_2 + \frac{1}{C_2 s},\ \infty,\ \infty,\ \frac{R_5\left(C_5 L_5 s^2 + 1\right)}{C_5 L_5 s^2 + C_5 R_5 s + 1}\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s^4\left(C_2C_5L_2L_5R_5Z_Lg_m - C_2C_5L_2L_5Z_L\right) + s^3\left(-C_2C_5L_2R_5Z_L + C_2C_5L_5R_2R_5Z_Lg_m - C_2C_5L_5R_2Z_L + C_2C_5L_5R_5Z_L\right) + s^2\left(-C_2C_5R_2R_5Z_L + C_2L_2R_5Z_Lg_m - C_2L_2Z_L + C_5}{R_5g_m + 2Z_Lg_m + s^4\left(C_2C_5L_2L_5R_5g_m + 2C_2C_5L_2L_5Z_Lg_m + C_2C_5L_2L_5\right) + s^3\left(2C_2C_5L_2R_5Z_Lg_m + C_2C_5L_2R_5 + C_2C_5L_5R_2R_5g_m + 2C_2C_5L_5R_2Z_Lg_m + C_2C_5L_5R_2 + C_2C_5L_5R_5 + 4C_2C_5L_5Z_L\right) + s^2\left(2C_2C_5R_2R_5Z_Lg_m + C_2C_5R_2R_5 + 4C_2C_5R_5Z_L + C_2L_2R_5g_m\right.$$

10.44 INVALID-ORDER-44 $Z(s) = \left(\infty,\ \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1},\ \infty,\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_2C_5L_2R_2Z_Ls^3 + R_2Z_Lg_m + Z_L + s^2\left(C_2L_2R_2Z_Lg_m + C_2L_2Z_L - C_5L_2Z_L\right) + s\left(-C_5R_2Z_L + L_2Z_Lg_m\right)}{R_2g_m + s^3\left(2C_2C_5L_2R_2Z_Lg_m + C_2C_5L_2R_2 + 4C_2C_5L_2Z_L\right) + s^2\left(C_2L_2R_2g_m + C_2L_2 + 2C_5L_2Z_Lg_m + C_5L_2\right) + s\left(2C_5R_2Z_Lg_m + C_5R_2 + 4C_5Z_L + L_2g_m\right) + 1}$$

10.45 INVALID-ORDER-45 $Z(s) = \left(\infty,\ \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1},\ \infty,\ \infty,\ \frac{R_5}{C_5 R_5 s + 1}\right)$

$$H(s) = \frac{-C_2C_5L_2R_2R_5Z_Ls^3 + R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L + s^2\left(C_2L_2R_2R_5Z_Lg_m - C_2L_2R_2Z_L + C_2L_2R_5Z_L - C_5L_2R_5Z_L\right) + s\left(-C_5R_2R_5Z_L + L_2R_5Z_Lg_m - L_2Z_L\right)}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s^3\left(2C_2C_5L_2R_2R_5Z_Lg_m + C_2C_5L_2R_2R_5 + 4C_2C_5L_2R_5Z_L\right) + s^2\left(C_2L_2R_2R_5g_m + 2C_2L_2R_2Z_Lg_m + C_2L_2R_2 + C_2L_2R_5 + 4C_2L_2Z_L + 2C_5L_2R_5Z_Lg_m + C_5L_2R_5\right) + s\left(2C_5R_2R_5Z_Lg_m + C_5R_2R_5 + 4C_5R_5Z_L + L_2R_5g_m + 2\right.$$

10.46 INVALID-ORDER-46 $Z(s) = \left(\infty,\ \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1},\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{R_2Z_Lg_m + Z_L + s^3\left(C_2C_5L_2R_2R_5Z_Lg_m - C_2C_5L_2R_2Z_L + C_2C_5L_2R_5Z_L\right) + s^2\left(C_2L_2R_2Z_Lg_m + C_2L_2Z_L + C_5L_2R_5Z_Lg_m - C_5L_2Z_L\right) + s\left(C_5R_2R_5Z_Lg_m - C_5R_2Z_L + C_5R_5Z_L + L_2Z_Lg_m\right)}{R_2g_m + s^3\left(C_2C_5L_2R_2R_5g_m + 2C_2C_5L_2R_2Z_Lg_m + C_2C_5L_2R_2 + C_2C_5L_2R_5 + 4C_2C_5L_2Z_L\right) + s^2\left(C_2L_2R_2g_m + C_2L_2 + C_5L_2R_5g_m + 2C_5L_2Z_Lg_m + C_5L_2\right) + s\left(C_5R_2R_5g_m + 2C_5R_2Z_Lg_m + C_5R_2 + C_5R_5 + 4C_5Z_L + L_2g_m\right) + 1}$$

10.47 INVALID-ORDER-47 $Z(s) = \left(\infty,\ \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1},\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{R_2Z_Lg_m + Z_L + s^4\left(C_2C_5L_2L_5R_2Z_Lg_m + C_2C_5L_2L_5Z_L\right) + s^3\left(-C_2C_5L_2R_2Z_L + C_5L_2L_5Z_Lg_m\right) + s^2\left(C_2L_2R_2Z_Lg_m + C_2L_2Z_L - C_5L_2Z_L + C_5L_5R_2Z_Lg_m + C_5L_5Z_L\right) + s\left(-C_5R_2Z_L + L_2Z_Lg_m\right)}{R_2g_m + s^4\left(C_2C_5L_2L_5R_2g_m + C_2C_5L_2L_5\right) + s^3\left(2C_2C_5L_2R_2Z_Lg_m + C_2C_5L_2R_2 + 4C_2C_5L_2Z_L + C_5L_2L_5g_m\right) + s^2\left(C_2L_2R_2g_m + C_2L_2 + 2C_5L_2Z_Lg_m + C_5L_2 + C_5L_5R_2g_m + C_5L_5\right) + s\left(2C_5R_2Z_Lg_m + C_5R_2 + 4C_5Z_L + L_2g_m\right) + 1}$$

10.48 INVALID-ORDER-48 $Z(s) = \left(\infty,\ \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1},\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{-C_2C_5L_2L_5R_2Z_Ls^4 - R_2Z_L + s^3\left(C_2L_2L_5R_2Z_Lg_m + C_2L_2L_5Z_L - C_5L_2L_5Z_L\right) + s^2\left(-C_2L_2R_2Z_L - C_5L_5R_2Z_L + L_2L_5Z_Lg_m\right) + s\left(-L_2Z_L + L_5R_2Z_Lg_m + L_5Z_L\right)}{2R_2Z_Lg_m + R_2 + 4Z_L + s^4\left(2C_2C_5L_2L_5R_2Z_Lg_m + C_2C_5L_2L_5R_2 + 4C_2C_5L_2L_5Z_L\right) + s^3\left(C_2L_2L_5R_2g_m + C_2L_2L_5 + 2C_5L_2L_5Z_Lg_m + C_5L_2L_5\right) + s^2\left(2C_2L_2R_2Z_Lg_m + C_2L_2R_2 + 4C_2L_2Z_L + 2C_5L_5R_2Z_Lg_m + C_5L_5R_2 + 4C_5L_5Z_L + L_2L_5g_m\right) + s\left(2L_2Z_Lg_m + L\right.$$

10.49 INVALID-ORDER-49 $Z(s) = \left(\infty,\ \frac{C_2 L_2 R_2 s^2 + L_2 s + R_2}{C_2 L_2 s^2 + 1},\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{R_2Z_Lg_m + Z_L + s^4\left(C_2C_5L_2L_5R_2Z_Lg_m + C_2C_5L_2L_5Z_L\right) + s^3\left(C_2C_5L_2R_2R_5Z_Lg_m - C_2C_5L_2R_2Z_L + C_2C_5L_2R_5Z_L + C_5L_2L_5Z_Lg_m\right) + s^2\left(C_2L_2R_2Z_Lg_m + C_2L_2Z_L + C_5L_2R_5Z_Lg_m - C_5L_2Z_L + C_5L_5R_2Z_Lg_m + C_5L_5Z_L\right) + s\left(C_5R_2R_5Z_Lg_m - C_5R_5}{R_2g_m + s^4\left(C_2C_5L_2L_5R_2g_m + C_2C_5L_2L_5\right) + s^3\left(C_2C_5L_2R_2R_5g_m + 2C_2C_5L_2R_2Z_Lg_m + C_2C_5L_2R_2 + C_2C_5L_2R_5 + 4C_2C_5L_2Z_L + C_5L_2L_5g_m\right) + s^2\left(C_2L_2R_2g_m + C_2L_2 + C_5L_2R_5g_m + 2C_5L_2Z_Lg_m + C_5L_2 + C_5L_5R_2g_m + C_5L_5\right) + s\left(C_5R_2R_5g_m + 2C_5R_2Z_Lg_m\right.$$

10.50 INVALID-ORDER-50 $Z(s) = \left(\infty,\ \frac{C_2L_2R_2s^2+L_2s+R_2}{C_2L_2s^2+1},\ \infty,\ \infty,\ \frac{L_5R_5s}{C_5L_5R_5s^2+L_5s+R_5}\right)$

$$H(s) = \frac{-C_2C_5L_2L_5R_2R_5Z_Ls^4 - R_2R_5Z_L + s^3\left(C_2L_2L_5R_2R_5Z_Lg_m - C_2L_2L_5R_2Z_L + C_2L_2L_5R_5Z_L - C_5L_2L_5R_5Z_L\right) + s^2\left(-C_2L_2R_2R_5Z_L - C_5L_5R_2R_5Z_L + L_2\right.}{2R_2R_5Z_Lg_m + R_2R_5 + 4R_5Z_L + s^4\left(2C_2C_5L_2L_5R_2R_5Z_Lg_m + C_2C_5L_2L_5R_2R_5 + 4C_2C_5L_2L_5R_5Z_L\right) + s^3\left(C_2L_2L_5R_2R_5g_m + 2C_2L_2L_5R_2Z_Lg_m + C_2L_2L_5R_2 + C_2L_2L_5R_5 + 4C_2L_2L_5Z_L + 2C_5L_2L_5R_5Z_Lg_m + C_5L_2L_5R_5\right) + s^2\left(2C_2L_2R_2R_5Z_Lg_m + C_2L_2R_2R_5 +\right.}$$

10.51 INVALID-ORDER-51 $Z(s) = \left(\infty,\ \frac{C_2L_2R_2s^2+L_2s+R_2}{C_2L_2s^2+1},\ \infty,\ \infty,\ \frac{C_5L_5R_5s^2+L_5s+R_5}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L + s^4\left(C_2C_5L_2L_5R_2R_5Z_Lg_m - C_2C_5L_2L_5R_2Z_L + C_2C_5L_2L_5R_5Z_L\right) + s^3\left(C_2L_2L_5R_2Z_Lg_m + C_2L_2L_5Z_L + C_5L_2L_5R_5Z_Lg_m - C_5L_2L_5Z_L\right) + s^2\left(C_2L_2R_2R_5Z_Lg_m - C_2L_2R_2Z_L + C_2L_2R_5Z\right.}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s^4\left(C_2C_5L_2L_5R_2R_5g_m + 2C_2C_5L_2L_5R_2Z_Lg_m + C_2C_5L_2L_5R_2 + C_2C_5L_2L_5R_5 + 4C_2C_5L_2L_5Z_L\right) + s^3\left(C_2L_2L_5R_2g_m + C_2L_2L_5 + C_5L_2L_5R_5g_m + 2C_5L_2L_5Z_Lg_m + C_5L_2L_5\right) + s^2\left(C_2L_2R_2R_5g_m + 2C_2L_2R_2Z_Lg_m + C_2L\right.}$$

10.52 INVALID-ORDER-52 $Z(s) = \left(\infty,\ \frac{C_2L_2R_2s^2+L_2s+R_2}{C_2L_2s^2+1},\ \infty,\ \infty,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1}\right)$

$$H(s) = \frac{R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L + s^4\left(C_2C_5L_2L_5R_2R_5Z_Lg_m - C_2C_5L_2L_5R_2Z_L + C_2C_5L_2L_5R_5Z_L\right) + s^3\left(-C_2C_5L_2R_2R_5Z_L + C_5L_2L_5R_5Z_Lg_m - C_5L_2L_5Z_L\right) + s^2\left(C_2L_2R_2\right.}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s^4\left(C_2C_5L_2L_5R_2R_5g_m + 2C_2C_5L_2L_5R_2Z_Lg_m + C_2C_5L_2L_5R_2 + C_2C_5L_2L_5R_5 + 4C_2C_5L_2L_5Z_L\right) + s^3\left(2C_2C_5L_2R_2R_5Z_Lg_m + C_2C_5L_2R_2R_5 + 4C_2C_5L_2R_5Z_L + C_5L_2L_5R_5g_m + 2C_5L_2L_5Z_Lg_m + C_5L_2L_5\right) + s^2\left(C_2L_2R_2\right.}$$

10.53 INVALID-ORDER-53 $Z(s) = \left(\infty,\ \frac{R_2\left(C_2L_2s^2+1\right)}{C_2L_2s^2+C_2R_2s+1},\ \infty,\ \infty,\ \frac{1}{C_5s}\right)$

$$H(s) = \frac{-C_2C_5L_2R_2Z_Ls^3 + R_2Z_Lg_m + Z_L + s^2\left(C_2L_2R_2Z_Lg_m + C_2L_2Z_L\right) + s\left(C_2R_2Z_L - C_5R_2Z_L\right)}{R_2g_m + s^3\left(2C_2C_5L_2R_2Z_Lg_m + C_2C_5L_2R_2 + 4C_2C_5L_2Z_L\right) + s^2\left(4C_2C_5R_2Z_L + C_2L_2R_2g_m + C_2L_2\right) + s\left(C_2R_2 + 2C_5R_2Z_Lg_m + C_5R_2 + 4C_5Z_L\right) + 1}$$

10.54 INVALID-ORDER-54 $Z(s) = \left(\infty,\ \frac{R_2\left(C_2L_2s^2+1\right)}{C_2L_2s^2+C_2R_2s+1},\ \infty,\ \infty,\ \frac{R_5}{C_5R_5s+1}\right)$

$$H(s) = \frac{-C_2C_5L_2R_2R_5Z_Ls^3 + R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L + s^2\left(C_2L_2R_2R_5Z_Lg_m - C_2L_2R_2Z_L + C_2L_2R_5Z_L\right) + s\left(C_2R_2R_5Z_L - C_5R_2R_5Z_L\right)}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s^3\left(2C_2C_5L_2R_2R_5Z_Lg_m + C_2C_5L_2R_2R_5 + 4C_2C_5L_2R_5Z_L\right) + s^2\left(4C_2C_5R_2R_5Z_L + C_2L_2R_2R_5g_m + 2C_2L_2R_2Z_Lg_m + C_2L_2R_2 + C_2L_2R_5 + 4C_2L_2Z_L\right) + s\left(C_2R_2R_5 + 4C_2R_2Z_L + 2C_5R_2R_5Z_Lg_m + C_5R_2R_5 + 4C_5R_5Z_L\right.}$$

10.55 INVALID-ORDER-55 $Z(s) = \left(\infty,\ \frac{R_2\left(C_2L_2s^2+1\right)}{C_2L_2s^2+C_2R_2s+1},\ \infty,\ \infty,\ R_5 + \frac{1}{C_5s}\right)$

$$H(s) = \frac{R_2Z_Lg_m + Z_L + s^3\left(C_2C_5L_2R_2R_5Z_Lg_m - C_2C_5L_2R_2Z_L + C_2C_5L_2R_5Z_L\right) + s^2\left(C_2C_5R_2R_5Z_L + C_2L_2R_2Z_Lg_m + C_2L_2Z_L\right) + s\left(C_2R_2Z_L + C_5R_2R_5Z_Lg_m - C_5R_2Z_L + C_5R_5Z_L\right)}{R_2g_m + s^3\left(C_2C_5L_2R_2R_5g_m + 2C_2C_5L_2R_2Z_Lg_m + C_2C_5L_2R_2 + C_2C_5L_2R_5 + 4C_2C_5L_2Z_L\right) + s^2\left(C_2C_5R_2R_5 + 4C_2C_5R_2Z_L + C_2L_2R_2g_m + C_2L_2\right) + s\left(C_2R_2 + C_5R_2R_5g_m + 2C_5R_2Z_Lg_m + C_5R_2 + C_5R_5 + 4C_5Z_L\right) + 1}$$

10.56 INVALID-ORDER-56 $Z(s) = \left(\infty,\ \frac{R_2\left(C_2L_2s^2+1\right)}{C_2L_2s^2+C_2R_2s+1},\ \infty,\ \infty,\ L_5s + \frac{1}{C_5s}\right)$

$$H(s) = \frac{R_2Z_Lg_m + Z_L + s^4\left(C_2C_5L_2L_5R_2Z_Lg_m + C_2C_5L_2L_5Z_L\right) + s^3\left(-C_2C_5L_2R_2Z_L + C_2C_5L_5R_2Z_L\right) + s^2\left(C_2L_2R_2Z_Lg_m + C_2L_2Z_L + C_5L_5R_2Z_Lg_m + C_5L_5Z_L\right) + s\left(C_2R_2Z_L - C_5R_2Z_L\right)}{R_2g_m + s^4\left(C_2C_5L_2L_5R_2g_m + C_2C_5L_2L_5\right) + s^3\left(2C_2C_5L_2R_2Z_Lg_m + C_2C_5L_2R_2 + 4C_2C_5L_2Z_L + C_2C_5L_5R_2\right) + s^2\left(4C_2C_5R_2Z_L + C_2L_2R_2g_m + C_2L_2 + C_5L_5R_2g_m + C_5L_5\right) + s\left(C_2R_2 + 2C_5R_2Z_Lg_m + C_5R_2 + 4C_5Z_L\right) + 1}$$

10.57 INVALID-ORDER-57 $Z(s) = \left(\infty,\ \frac{R_2\left(C_2L_2s^2+1\right)}{C_2L_2s^2+C_2R_2s+1},\ \infty,\ \infty,\ \frac{L_5s}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{-C_2C_5L_2L_5R_2Z_Ls^4 - R_2Z_L + s^3\left(C_2L_2L_5R_2Z_Lg_m + C_2L_2L_5Z_L\right) + s^2\left(-C_2L_2R_2Z_L + C_2L_5R_2Z_L - C_5L_5R_2Z_L\right) + s\left(L_5R_2Z_Lg_m + L_5Z_L\right)}{2R_2Z_Lg_m + R_2 + 4Z_L + s^4\left(2C_2C_5L_2L_5R_2Z_Lg_m + C_2C_5L_2L_5R_2 + 4C_2C_5L_2L_5Z_L\right) + s^3\left(4C_2C_5L_5R_2Z_L + C_2L_2L_5R_2g_m + C_2L_2L_5\right) + s^2\left(2C_2L_2R_2Z_Lg_m + C_2L_2R_2 + 4C_2L_2Z_L + C_2L_5R_2 + 2C_5L_5R_2Z_Lg_m + C_5L_5R_2 + 4C_5L_5Z_L\right) + s\left(4C_2R_2Z_L + L_5R_2g_m + L\right.}$$

10.58 INVALID-ORDER-58 $Z(s) = \left(\infty,\ \frac{R_2\left(C_2L_2s^2+1\right)}{C_2L_2s^2+C_2R_2s+1},\ \infty,\ \infty,\ L_5s + R_5 + \frac{1}{C_5s}\right)$

$$H(s) = \frac{R_2Z_Lg_m + Z_L + s^4\left(C_2C_5L_2L_5R_2Z_Lg_m + C_2C_5L_2L_5Z_L\right) + s^3\left(C_2C_5L_2R_2R_5Z_Lg_m - C_2C_5L_2R_2Z_L + C_2C_5L_2R_5Z_L + C_2C_5L_5R_2Z_L\right) + s^2\left(C_2C_5R_2R_5Z_L + C_2L_2R_2Z_Lg_m + C_2L_2Z_L + C_5L_5R_2Z_Lg_m + C_5L_5Z_L\right) + s\left(C_2R_2Z_L + C_5R_2R_5Z_Lg_m - C_5\right.}{R_2g_m + s^4\left(C_2C_5L_2L_5R_2g_m + C_2C_5L_2L_5\right) + s^3\left(C_2C_5L_2R_2R_5g_m + 2C_2C_5L_2R_2Z_Lg_m + C_2C_5L_2R_2 + C_2C_5L_2R_5 + 4C_2C_5L_2Z_L + C_2C_5L_5R_2\right) + s^2\left(C_2C_5R_2R_5 + 4C_2C_5R_2Z_L + C_2L_2R_2g_m + C_2L_2 + C_5L_5R_2g_m + C_5L_5\right) + s\left(C_2R_2 + C_5R_2R_5g_m + 2C_5R_2Z_Lg_m\right.}$$

10.59 INVALID-ORDER-59 $Z(s) = \left(\infty,\ \frac{R_2\left(C_2L_2s^2+1\right)}{C_2L_2s^2+C_2R_2s+1},\ \infty,\ \infty,\ \frac{L_5R_5s}{C_5L_5R_5s^2+L_5s+R_5}\right)$

$$H(s) = \frac{-C_2C_5L_2L_5R_2R_5Z_Ls^4 - R_2R_5Z_L + s^3\left(C_2L_2L_5R_2R_5Z_Lg_m - C_2L_2L_5R_2Z_L + C_2L_2L_5R_5Z_L\right) + s^2\left(-C_2L_2R_2R_5Z_L + C_2L_5R_2R_5Z_L - C_5L_5R_2R_5Z_L\right)}{2R_2R_5Z_Lg_m + R_2R_5 + 4R_5Z_L + s^4\left(2C_2C_5L_2L_5R_2R_5Z_Lg_m + C_2C_5L_2L_5R_2R_5 + 4C_2C_5L_2L_5R_5Z_L\right) + s^3\left(4C_2C_5L_5R_2R_5Z_L + C_2L_2L_5R_2R_5g_m + 2C_2L_2L_5R_2Z_Lg_m + C_2L_2L_5R_2 + C_2L_2L_5R_5 + 4C_2L_2L_5Z_L\right) + s^2\left(2C_2L_2R_2R_5Z_Lg_m + C_2L_2R_2R_5 + 4C_2L_2R_5Z_L\right.}$$

10.60 INVALID-ORDER-60 $Z(s) = \left(\infty,\ \frac{R_2\left(C_2L_2s^2+1\right)}{C_2L_2s^2+C_2R_2s+1},\ \infty,\ \infty,\ \frac{C_5L_5R_5s^2+L_5s+R_5}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L + s^4\left(C_2C_5L_2L_5R_2R_5Z_Lg_m - C_2C_5L_2L_5R_2Z_L + C_2C_5L_2L_5R_5Z_L\right) + s^3\left(C_2C_5L_5R_2R_5Z_L + C_2L_2L_5R_2Z_Lg_m + C_2L_2L_5Z_L\right) + s^2\left(C_2L_2R_2R_5Z_Lg_m - C_2L_2R_2Z_L + C_2L_2R_5Z_L + C_2L_5L\right.}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s^4\left(C_2C_5L_2L_5R_2R_5g_m + 2C_2C_5L_2L_5R_2Z_Lg_m + C_2C_5L_2L_5R_2 + C_2C_5L_2L_5R_5 + 4C_2C_5L_2L_5Z_L\right) + s^3\left(C_2C_5L_5R_2R_5 + 4C_2C_5L_5R_2Z_L + C_2L_2L_5R_2g_m + C_2L_2L_5\right) + s^2\left(C_2L_2R_2R_5g_m + 2C_2L_2R_2Z_Lg_m + C_2L_2R_2 + C_2L\right.}$$

10.61 INVALID-ORDER-61 $Z(s) = \left(\infty,\ \frac{R_2\left(C_2L_2s^2+1\right)}{C_2L_2s^2+C_2R_2s+1},\ \infty,\ \infty,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1}\right)$

$$H(s) = \frac{R_2R_5Z_Lg_m - R_2Z_L + R_5Z_L + s^4\left(C_2C_5L_2L_5R_2R_5Z_Lg_m - C_2C_5L_2L_5R_2Z_L + C_2C_5L_2L_5R_5Z_L\right) + s^3\left(-C_2C_5L_2R_2R_5Z_L + C_2C_5L_5R_2R_5Z_L\right) + s^2\left(C_2L_2R_2R_5Z_Lg_m\right.}{R_2R_5g_m + 2R_2Z_Lg_m + R_2 + R_5 + 4Z_L + s^4\left(C_2C_5L_2L_5R_2R_5g_m + 2C_2C_5L_2L_5R_2Z_Lg_m + C_2C_5L_2L_5R_2 + C_2C_5L_2L_5R_5 + 4C_2C_5L_2L_5Z_L\right) + s^3\left(2C_2C_5L_2R_2R_5Z_Lg_m + C_2C_5L_2R_2R_5 + 4C_2C_5L_2R_5Z_L + C_2C_5L_5R_2R_5 + 4C_2C_5L_5R_2Z_L\right) + s^2\left(4C_2C_5R_2R_5Z_L + C\right.}$$

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