Filter Summary Report: CG,TIA,simple,Z3,Z5

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Contents

1 Examined $H(z)$ for CG TIA simple Z3 Z5: $\frac{Z_3 Z_5 Z_L g_m - Z_3 Z_L}{Z_3 Z_5 g_m + 2 Z_3 Z_L g_m + Z_3 + Z_5 Z_L g_m + Z_L}$

$$H(z) = \frac{Z_3 Z_5 Z_L g_m - Z_3 Z_L}{Z_3 Z_5 g_m + 2 Z_3 Z_L g_m + Z_3 + Z_5 Z_L g_m + Z_L}$$

2 HP

3 BP

3.1 BP-1 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 s}{C_3 L_3 s^2 + 1},\ \infty,\ R_5\right)$

$$H(s) = \frac{s\left(L_3 R_5 Z_L g_m - L_3 Z_L\right)}{R_5 Z_L g_m + Z_L + s^2\left(C_3 L_3 R_5 Z_L g_m + C_3 L_3 Z_L\right) + s\left(L_3 R_5 g_m + 2 L_3 Z_L g_m + L_3\right)}$$

Parameters:

Q: $\frac{C_3 R_5 Z_L g_m \sqrt{\frac{1}{C_3 L_3}} + C_3 Z_L \sqrt{\frac{1}{C_3 L_3}}}{R_5 g_m + 2 Z_L g_m + 1}$
wo: $\sqrt{\frac{1}{C_3 L_3}}$
bandwidth: $\frac{\sqrt{\frac{1}{C_3 L_3}} (R_5 g_m + 2 Z_L g_m + 1)}{C_3 R_5 Z_L g_m \sqrt{\frac{1}{C_3 L_3}} + C_3 Z_L \sqrt{\frac{1}{C_3 L_3}}}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_5 Z_L g_m - Z_L}{R_5 g_m + 2 Z_L g_m + 1}$
Qz: None
Wz: None

3.2 BP-2 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3},\ \infty,\ R_5\right)$

$$H(s) = \frac{s\left(L_3 R_3 R_5 Z_L g_m - L_3 R_3 Z_L\right)}{R_3 R_5 Z_L g_m + R_3 Z_L + s^2\left(C_3 L_3 R_3 R_5 Z_L g_m + C_3 L_3 R_3 Z_L\right) + s\left(L_3 R_3 R_5 g_m + 2 L_3 R_3 Z_L g_m + L_3 R_3 + L_3 R_5 Z_L g_m + L_3 Z_L\right)}$$

Parameters:

Q: $\frac{C_3 R_3 R_5 Z_L g_m \sqrt{\frac{1}{C_3 L_3}} + C_3 R_3 Z_L \sqrt{\frac{1}{C_3 L_3}}}{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}$
wo: $\sqrt{\frac{1}{C_3 L_3}}$
bandwidth: $\frac{\sqrt{\frac{1}{C_3 L_3}} (R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L)}{C_3 R_3 R_5 Z_L g_m \sqrt{\frac{1}{C_3 L_3}} + C_3 R_3 Z_L \sqrt{\frac{1}{C_3 L_3}}}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_3 R_5 Z_L g_m - R_3 Z_L}{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}$
Qz: None
Wz: None

4 LP

5 BS

5.1 BS-1 $Z(s) = \left(\infty,\ \infty,\ L_3 s + \frac{1}{C_3 s},\ \infty,\ R_5\right)$

$$H(s) = \frac{R_5 Z_L g_m - Z_L + s^2 \left(C_3 L_3 R_5 Z_L g_m - C_3 L_3 Z_L\right)}{R_5 g_m + 2 Z_L g_m + s^2 \left(C_3 L_3 R_5 g_m + 2 C_3 L_3 Z_L g_m + C_3 L_3\right) + s \left(C_3 R_5 Z_L g_m + C_3 Z_L\right) + 1}$$

Parameters:

Q: $\frac{L_3 R_5 g_m \sqrt{\frac{1}{C_3 L_3}} + 2 L_3 Z_L g_m \sqrt{\frac{1}{C_3 L_3}} + L_3 \sqrt{\frac{1}{C_3 L_3}}}{R_5 Z_L g_m + Z_L}$

wo: $\sqrt{\frac{1}{C_3 L_3}}$

bandwidth: $\frac{\sqrt{\frac{1}{C_3 L_3}} \left(R_5 Z_L g_m + Z_L\right)}{L_3 R_5 g_m \sqrt{\frac{1}{C_3 L_3}} + 2 L_3 Z_L g_m \sqrt{\frac{1}{C_3 L_3}} + L_3 \sqrt{\frac{1}{C_3 L_3}}}$

K-LP: $\frac{R_5 Z_L g_m - Z_L}{R_5 g_m + 2 Z_L g_m + 1}$

K-HP: $\frac{R_5 Z_L g_m - Z_L}{R_5 g_m + 2 Z_L g_m + 1}$

K-BP: 0

Qz: None

Wz: $\sqrt{\frac{1}{C_3 L_3}}$

5.2 BS-2 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3\left(C_3 L_3 s^2 + 1\right)}{C_3 L_3 s^2 + C_3 R_3 s + 1},\ \infty,\ R_5\right)$

$$H(s) = \frac{R_3 R_5 Z_L g_m - R_3 Z_L + s^2 \left(C_3 L_3 R_3 R_5 Z_L g_m - C_3 L_3 R_3 Z_L\right)}{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L + s^2 \left(C_3 L_3 R_3 R_5 g_m + 2 C_3 L_3 R_3 Z_L g_m + C_3 L_3 R_3 + C_3 L_3 R_5 Z_L g_m + C_3 L_3 Z_L\right) + s \left(C_3 R_3 R_5 Z_L g_m + C_3 R_3 Z_L\right)}$$

Parameters:

Q: $\frac{L_3 R_3 R_5 g_m \sqrt{\frac{1}{C_3 L_3}} + 2 L_3 R_3 Z_L g_m \sqrt{\frac{1}{C_3 L_3}} + L_3 R_3 \sqrt{\frac{1}{C_3 L_3}} + L_3 R_5 Z_L g_m \sqrt{\frac{1}{C_3 L_3}} + L_3 Z_L \sqrt{\frac{1}{C_3 L_3}}}{R_3 R_5 Z_L g_m + R_3 Z_L}$

wo: $\sqrt{\frac{1}{C_3 L_3}}$

bandwidth: $\frac{\sqrt{\frac{1}{C_3 L_3}} \left(R_3 R_5 Z_L g_m + R_3 Z_L\right)}{L_3 R_3 R_5 g_m \sqrt{\frac{1}{C_3 L_3}} + 2 L_3 R_3 Z_L g_m \sqrt{\frac{1}{C_3 L_3}} + L_3 R_3 \sqrt{\frac{1}{C_3 L_3}} + L_3 R_5 Z_L g_m \sqrt{\frac{1}{C_3 L_3}} + L_3 Z_L \sqrt{\frac{1}{C_3 L_3}}}$

K-LP: $\frac{R_3 R_5 Z_L g_m - R_3 Z_L}{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}$

K-HP: $\frac{R_3 R_5 Z_L g_m - R_3 Z_L}{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}$

K-BP: 0

Qz: None

Wz: $\sqrt{\frac{1}{C_3 L_3}}$

6 GE

6.1 GE-1 $Z(s) = \left(\infty,\ \infty,\ R_3,\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_5 L_5 R_3 Z_L g_m s^2 - C_5 R_3 Z_L s + R_3 Z_L g_m}{R_3 g_m + Z_L g_m + s^2 \left(C_5 L_5 R_3 g_m + C_5 L_5 Z_L g_m\right) + s \left(2 C_5 R_3 Z_L g_m + C_5 R_3 + C_5 Z_L\right)}$$

Parameters:

Q: $\frac{L_5 R_3 g_m \sqrt{\frac{1}{C_5 L_5}} + L_5 Z_L g_m \sqrt{\frac{1}{C_5 L_5}}}{2 R_3 Z_L g_m + R_3 + Z_L}$

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

bandwidth: $\frac{\sqrt{\frac{1}{C_5 L_5}} \left(2 R_3 Z_L g_m + R_3 + Z_L\right)}{L_5 R_3 g_m \sqrt{\frac{1}{C_5 L_5}} + L_5 Z_L g_m \sqrt{\frac{1}{C_5 L_5}}}$

K-LP: $\frac{R_3 Z_L}{R_3 + Z_L}$

K-HP: $\frac{R_3 Z_L}{R_3 + Z_L}$

K-BP: $-\frac{R_3 Z_L}{2 R_3 Z_L g_m + R_3 + Z_L}$

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

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

6.2 GE-2 $Z(s) = \left(\infty,\ \infty,\ R_3,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1}\right)$

$$H(s) = \frac{-C_5 L_5 R_3 Z_L s^2 + L_5 R_3 Z_L g_m s - R_3 Z_L}{2R_3 Z_L g_m + R_3 + Z_L + s^2\left(2C_5 L_5 R_3 Z_L g_m + C_5 L_5 R_3 + C_5 L_5 Z_L\right) + s\left(L_5 R_3 g_m + L_5 Z_L g_m\right)}$$

Parameters:

Q: $\frac{2C_5 R_3 Z_L g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_3 \sqrt{\frac{1}{C_5 L_5}} + C_5 Z_L \sqrt{\frac{1}{C_5 L_5}}}{R_3 g_m + Z_L g_m}$

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

bandwidth: $\frac{\sqrt{\frac{1}{C_5 L_5}}\left(R_3 g_m + Z_L g_m\right)}{2C_5 R_3 Z_L g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_3 \sqrt{\frac{1}{C_5 L_5}} + C_5 Z_L \sqrt{\frac{1}{C_5 L_5}}}$

K-LP: $-\frac{R_3 Z_L}{2R_3 Z_L g_m + R_3 + Z_L}$

K-HP: $-\frac{R_3 Z_L}{2R_3 Z_L g_m + R_3 + Z_L}$

K-BP: $\frac{R_3 Z_L}{R_3 + Z_L}$

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 $Z(s) = \left(\infty,\ \infty,\ R_3,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_5 L_5 R_3 Z_L g_m s^2 + R_3 Z_L g_m + s\left(C_5 R_3 R_5 Z_L g_m - C_5 R_3 Z_L\right)}{R_3 g_m + Z_L g_m + s^2\left(C_5 L_5 R_3 g_m + C_5 L_5 Z_L g_m\right) + s\left(C_5 R_3 R_5 g_m + 2C_5 R_3 Z_L g_m + C_5 R_3 + C_5 R_5 Z_L g_m + C_5 Z_L\right)}$$

Parameters:

Q: $\frac{L_5 R_3 g_m \sqrt{\frac{1}{C_5 L_5}} + L_5 Z_L g_m \sqrt{\frac{1}{C_5 L_5}}}{R_3 R_5 g_m + 2R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}$

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

bandwidth: $\frac{\sqrt{\frac{1}{C_5 L_5}}\left(R_3 R_5 g_m + 2R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L\right)}{L_5 R_3 g_m \sqrt{\frac{1}{C_5 L_5}} + L_5 Z_L g_m \sqrt{\frac{1}{C_5 L_5}}}$

K-LP: $\frac{R_3 Z_L}{R_3 + Z_L}$

K-HP: $\frac{R_3 Z_L}{R_3 + Z_L}$

K-BP: $\frac{R_3 R_5 Z_L g_m - R_3 Z_L}{R_3 R_5 g_m + 2R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}$

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 $Z(s) = \left(\infty,\ \infty,\ R_3,\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5}\right)$

$$H(s) = \frac{-C_5 L_5 R_3 R_5 Z_L s^2 - R_3 R_5 Z_L + s\left(L_5 R_3 R_5 Z_L g_m - L_5 R_3 Z_L\right)}{2R_3 R_5 Z_L g_m + R_3 R_5 + R_5 Z_L + s^2\left(2C_5 L_5 R_3 R_5 Z_L g_m + C_5 L_5 R_3 R_5 + C_5 L_5 R_5 Z_L\right) + s\left(L_5 R_3 R_5 g_m + 2L_5 R_3 Z_L g_m + L_5 R_3 + L_5 R_5 Z_L g_m + L_5 Z_L\right)}$$

Parameters:

Q: $\frac{2C_5 R_3 R_5 Z_L g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_3 R_5 \sqrt{\frac{1}{C_5 L_5}} + C_5 R_5 Z_L \sqrt{\frac{1}{C_5 L_5}}}{R_3 R_5 g_m + 2R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}$

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

bandwidth: $\frac{\sqrt{\frac{1}{C_5 L_5}}\left(R_3 R_5 g_m + 2R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L\right)}{2C_5 R_3 R_5 Z_L g_m \sqrt{\frac{1}{C_5 L_5}} + C_5 R_3 R_5 \sqrt{\frac{1}{C_5 L_5}} + C_5 R_5 Z_L \sqrt{\frac{1}{C_5 L_5}}}$

K-LP: $-\frac{R_3 Z_L}{2R_3 Z_L g_m + R_3 + Z_L}$

K-HP: $-\frac{R_3 Z_L}{2R_3 Z_L g_m + R_3 + Z_L}$

K-BP: $\frac{R_3 R_5 Z_L g_m - R_3 Z_L}{R_3 R_5 g_m + 2R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}$

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 $Z(s) = \left(\infty,\ \infty,\ R_3,\ \infty,\ \frac{C_5L_5R_5s^2+L_5s+R_5}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{L_5R_3Z_Lg_ms + R_3R_5Z_Lg_m - R_3Z_L + s^2\left(C_5L_5R_3R_5Z_Lg_m - C_5L_5R_3Z_L\right)}{R_3R_5g_m + 2R_3Z_Lg_m + R_3 + R_5Z_Lg_m + Z_L + s^2\left(C_5L_5R_3R_5g_m + 2C_5L_5R_3Z_Lg_m + C_5L_5R_3 + C_5L_5R_5Z_Lg_m + C_5L_5Z_L\right) + s\left(L_5R_3g_m + L_5Z_Lg_m\right)}$$

Parameters:

Q: $\frac{C_5R_3R_5g_m\sqrt{\frac{1}{C_5L_5}}+2C_5R_3Z_Lg_m\sqrt{\frac{1}{C_5L_5}}+C_5R_3\sqrt{\frac{1}{C_5L_5}}+C_5R_5Z_Lg_m\sqrt{\frac{1}{C_5L_5}}+C_5Z_L\sqrt{\frac{1}{C_5L_5}}}{R_3g_m+Z_Lg_m}$

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

bandwidth: $\frac{\sqrt{\frac{1}{C_5L_5}}(R_3g_m+Z_Lg_m)}{C_5R_3R_5g_m\sqrt{\frac{1}{C_5L_5}}+2C_5R_3Z_Lg_m\sqrt{\frac{1}{C_5L_5}}+C_5R_3\sqrt{\frac{1}{C_5L_5}}+C_5R_5Z_Lg_m\sqrt{\frac{1}{C_5L_5}}+C_5Z_L\sqrt{\frac{1}{C_5L_5}}}$

K-LP: $\frac{R_3R_5Z_Lg_m-R_3Z_L}{R_3R_5g_m+2R_3Z_Lg_m+R_3+R_5Z_Lg_m+Z_L}$

K-HP: $\frac{R_3R_5Z_Lg_m-R_3Z_L}{R_3R_5g_m+2R_3Z_Lg_m+R_3+R_5Z_Lg_m+Z_L}$

K-BP: $\frac{R_3Z_L}{R_3+Z_L}$

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 $Z(s) = \left(\infty,\ \infty,\ R_3,\ \infty,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1}\right)$

$$H(s) = \frac{-C_5R_3R_5Z_Ls + R_3R_5Z_Lg_m - R_3Z_L + s^2\left(C_5L_5R_3R_5Z_Lg_m - C_5L_5R_3Z_L\right)}{R_3R_5g_m + 2R_3Z_Lg_m + R_3 + R_5Z_Lg_m + Z_L + s^2\left(C_5L_5R_3R_5g_m + 2C_5L_5R_3Z_Lg_m + C_5L_5R_3 + C_5L_5R_5Z_Lg_m + C_5L_5Z_L\right) + s\left(2C_5R_3R_5Z_Lg_m + C_5R_3R_5 + C_5R_5Z_L\right)}$$

Parameters:

Q: $\frac{L_5R_3R_5g_m\sqrt{\frac{1}{C_5L_5}}+2L_5R_3Z_Lg_m\sqrt{\frac{1}{C_5L_5}}+L_5R_3\sqrt{\frac{1}{C_5L_5}}+L_5R_5Z_Lg_m\sqrt{\frac{1}{C_5L_5}}+L_5Z_L\sqrt{\frac{1}{C_5L_5}}}{2R_3R_5Z_Lg_m+R_3R_5+R_5Z_L}$

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

bandwidth: $\frac{\sqrt{\frac{1}{C_5L_5}}(2R_3R_5Z_Lg_m+R_3R_5+R_5Z_L)}{L_5R_3R_5g_m\sqrt{\frac{1}{C_5L_5}}+2L_5R_3Z_Lg_m\sqrt{\frac{1}{C_5L_5}}+L_5R_3\sqrt{\frac{1}{C_5L_5}}+L_5R_5Z_Lg_m\sqrt{\frac{1}{C_5L_5}}+L_5Z_L\sqrt{\frac{1}{C_5L_5}}}$

K-LP: $\frac{R_3R_5Z_Lg_m-R_3Z_L}{R_3R_5g_m+2R_3Z_Lg_m+R_3+R_5Z_Lg_m+Z_L}$

K-HP: $\frac{R_3R_5Z_Lg_m-R_3Z_L}{R_3R_5g_m+2R_3Z_Lg_m+R_3+R_5Z_Lg_m+Z_L}$

K-BP: $-\frac{R_3Z_L}{2R_3Z_Lg_m+R_3+Z_L}$

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 $Z(s) = \left(\infty,\ \infty,\ L_3s + R_3 + \frac{1}{C_3s},\ \infty,\ R_5\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s^2\left(C_3L_3R_5Z_Lg_m - C_3L_3Z_L\right) + s\left(C_3R_3R_5Z_Lg_m - C_3R_3Z_L\right)}{R_5g_m + 2Z_Lg_m + s^2\left(C_3L_3R_5g_m + 2C_3L_3Z_Lg_m + C_3L_3\right) + s\left(C_3R_3R_5g_m + 2C_3R_3Z_Lg_m + C_3R_3 + C_3R_5Z_Lg_m + C_3Z_L\right) + 1}$$

Parameters:

Q: $\frac{L_3R_5g_m\sqrt{\frac{1}{C_3L_3}}+2L_3Z_Lg_m\sqrt{\frac{1}{C_3L_3}}+L_3\sqrt{\frac{1}{C_3L_3}}}{R_3R_5g_m+2R_3Z_Lg_m+R_3+R_5Z_Lg_m+Z_L}$

wo: $\sqrt{\frac{1}{C_3L_3}}$

bandwidth: $\frac{\sqrt{\frac{1}{C_3L_3}}(R_3R_5g_m+2R_3Z_Lg_m+R_3+R_5Z_Lg_m+Z_L)}{L_3R_5g_m\sqrt{\frac{1}{C_3L_3}}+2L_3Z_Lg_m\sqrt{\frac{1}{C_3L_3}}+L_3\sqrt{\frac{1}{C_3L_3}}}$

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: $\frac{R_3R_5Z_Lg_m-R_3Z_L}{R_3R_5g_m+2R_3Z_Lg_m+R_3+R_5Z_Lg_m+Z_L}$

Qz: $\frac{L_3\sqrt{\frac{1}{C_3L_3}}}{R_3}$

Wz: $\sqrt{\frac{1}{C_3L_3}}$

6.8 GE-8 $Z(s) = \left(\infty,\ \infty,\ \frac{C_3L_3R_3s^2+L_3s+R_3}{C_3L_3s^2+1},\ \infty,\ R_5\right)$

$$H(s) = \frac{R_3R_5Z_Lg_m - R_3Z_L + s^2\left(C_3L_3R_3R_5Z_Lg_m - C_3L_3R_3Z_L\right) + s\left(L_3R_5Z_Lg_m - L_3Z_L\right)}{R_3R_5g_m + 2R_3Z_Lg_m + R_3 + R_5Z_Lg_m + Z_L + s^2\left(C_3L_3R_3R_5g_m + 2C_3L_3R_3Z_Lg_m + C_3L_3R_3 + C_3L_3R_5Z_Lg_m + C_3L_3Z_L\right) + s\left(L_3R_5g_m + 2L_3Z_Lg_m + L_3\right)}$$

Parameters:

Q: $\frac{C_3R_3R_5g_m\sqrt{\frac{1}{C_3L_3}}+2C_3R_3Z_Lg_m\sqrt{\frac{1}{C_3L_3}}+C_3R_3\sqrt{\frac{1}{C_3L_3}}+C_3R_5Z_Lg_m\sqrt{\frac{1}{C_3L_3}}+C_3Z_L\sqrt{\frac{1}{C_3L_3}}}{R_5g_m+2Z_Lg_m+1}$
wo: $\sqrt{\frac{1}{C_3L_3}}$
bandwidth: $\frac{\sqrt{\frac{1}{C_3L_3}}(R_5g_m+2Z_Lg_m+1)}{C_3R_3R_5g_m\sqrt{\frac{1}{C_3L_3}}+2C_3R_3Z_Lg_m\sqrt{\frac{1}{C_3L_3}}+C_3R_3\sqrt{\frac{1}{C_3L_3}}+C_3R_5Z_Lg_m\sqrt{\frac{1}{C_3L_3}}+C_3Z_L\sqrt{\frac{1}{C_3L_3}}}$
K-LP: $\frac{R_3R_5Z_Lg_m-R_3Z_L}{R_3R_5g_m+2R_3Z_Lg_m+R_3+R_5Z_Lg_m+Z_L}$
K-HP: $\frac{R_3R_5Z_Lg_m-R_3Z_L}{R_3R_5g_m+2R_3Z_Lg_m+R_3+R_5Z_Lg_m+Z_L}$
K-BP: $\frac{R_5Z_Lg_m-Z_L}{R_5g_m+2Z_Lg_m+1}$
Qz: $C_3R_3\sqrt{\frac{1}{C_3L_3}}$
Wz: $\sqrt{\frac{1}{C_3L_3}}$

7 AP

8 INVALID-NUMER

8.1 INVALID-NUMER-1 $Z(s) = \left(\infty,\ \infty,\ \frac{1}{C_3s},\ \infty,\ \frac{1}{C_5s}\right)$

$$H(s) = \frac{-C_5Z_Ls + Z_Lg_m}{C_3C_5Z_Ls^2 + g_m + s\left(C_3Z_Lg_m + 2C_5Z_Lg_m + C_5\right)}$$

Parameters:

Q: $\frac{C_3C_5Z_L\sqrt{\frac{g_m}{C_3C_5Z_L}}}{C_3Z_Lg_m+2C_5Z_Lg_m+C_5}$
wo: $\sqrt{\frac{g_m}{C_3C_5Z_L}}$
bandwidth: $\frac{C_3Z_Lg_m+2C_5Z_Lg_m+C_5}{C_3C_5Z_L}$
K-LP: Z_L
K-HP: 0
K-BP: $-\frac{C_5Z_L}{C_3Z_Lg_m+2C_5Z_Lg_m+C_5}$
Qz: None
Wz: None

8.2 INVALID-NUMER-2 $Z(s) = \left(\infty,\ \infty,\ \frac{1}{C_3s},\ \infty,\ \frac{R_5}{C_5R_5s+1}\right)$

$$H(s) = \frac{-C_5R_5Z_Ls + R_5Z_Lg_m - Z_L}{C_3C_5R_5Z_Ls^2 + R_5g_m + 2Z_Lg_m + s\left(C_3R_5Z_Lg_m + C_3Z_L + 2C_5R_5Z_Lg_m + C_5R_5\right) + 1}$$

Parameters:

Q: $\frac{C_3C_5R_5Z_L\sqrt{\frac{g_m}{C_3C_5Z_L}+\frac{2g_m}{C_3C_5R_5}+\frac{1}{C_3C_5R_5Z_L}}}{C_3R_5Z_Lg_m+C_3Z_L+2C_5R_5Z_Lg_m+C_5R_5}$
wo: $\sqrt{\frac{R_5g_m+2Z_Lg_m+1}{C_3C_5R_5Z_L}}$
bandwidth: $\frac{\sqrt{\frac{R_5g_m+2Z_Lg_m+1}{C_3C_5R_5Z_L}}(C_3R_5Z_Lg_m+C_3Z_L+2C_5R_5Z_Lg_m+C_5R_5)}{C_3C_5R_5Z_L\sqrt{\frac{g_m}{C_3C_5Z_L}+\frac{2g_m}{C_3C_5R_5}+\frac{1}{C_3C_5R_5Z_L}}}$
K-LP: $\frac{R_5Z_Lg_m-Z_L}{R_5g_m+2Z_Lg_m+1}$
K-HP: 0
K-BP: $-\frac{C_5R_5Z_L}{C_3R_5Z_Lg_m+C_3Z_L+2C_5R_5Z_Lg_m+C_5R_5}$
Qz: None
Wz: None

8.3 INVALID-NUMER-3 $Z(s) = \left(\infty,\ \infty,\ \frac{1}{C_3 s},\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{Z_L g_m + s\left(C_5 R_5 Z_L g_m - C_5 Z_L\right)}{g_m + s^2\left(C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L\right) + s\left(C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right)}$$

Parameters:

Q: $\frac{C_3 C_5 R_5 Z_L g_m \sqrt{\frac{g_m}{C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}} + C_3 C_5 Z_L \sqrt{\frac{g_m}{C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}}}{C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5}$

wo: $\sqrt{\frac{g_m}{C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}}$

bandwidth: $\frac{\sqrt{\frac{g_m}{C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}}\left(C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right)}{C_3 C_5 R_5 Z_L g_m \sqrt{\frac{g_m}{C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}} + C_3 C_5 Z_L \sqrt{\frac{g_m}{C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}}}$

K-LP: Z_L

K-HP: 0

K-BP: $\frac{C_5 R_5 Z_L g_m - C_5 Z_L}{C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5}$

Qz: None

Wz: None

8.4 INVALID-NUMER-4 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3}{C_3 R_3 s + 1},\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_5 R_3 Z_L s + R_3 Z_L g_m}{C_3 C_5 R_3 Z_L s^2 + R_3 g_m + Z_L g_m + s\left(C_3 R_3 Z_L g_m + 2 C_5 R_3 Z_L g_m + C_5 R_3 + C_5 Z_L\right)}$$

Parameters:

Q: $\frac{C_3 C_5 R_3 Z_L \sqrt{\frac{g_m}{C_3 C_5 Z_L} + \frac{g_m}{C_3 C_5 R_3}}}{C_3 R_3 Z_L g_m + 2 C_5 R_3 Z_L g_m + C_5 R_3 + C_5 Z_L}$

wo: $\sqrt{\frac{R_3 g_m + Z_L g_m}{C_3 C_5 R_3 Z_L}}$

bandwidth: $\frac{\sqrt{\frac{R_3 g_m + Z_L g_m}{C_3 C_5 R_3 Z_L}}\left(C_3 R_3 Z_L g_m + 2 C_5 R_3 Z_L g_m + C_5 R_3 + C_5 Z_L\right)}{C_3 C_5 R_3 Z_L \sqrt{\frac{g_m}{C_3 C_5 Z_L} + \frac{g_m}{C_3 C_5 R_3}}}$

K-LP: $\frac{R_3 Z_L}{R_3 + Z_L}$

K-HP: 0

K-BP: $-\frac{C_5 R_3 Z_L}{C_3 R_3 Z_L g_m + 2 C_5 R_3 Z_L g_m + C_5 R_3 + C_5 Z_L}$

Qz: None

Wz: None

8.5 INVALID-NUMER-5 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3}{C_3 R_3 s + 1},\ \infty,\ \frac{R_5}{C_5 R_5 s + 1}\right)$

$$H(s) = \frac{-C_5 R_3 R_5 Z_L s + R_3 R_5 Z_L g_m - R_3 Z_L}{C_3 C_5 R_3 R_5 Z_L s^2 + R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L + s\left(C_3 R_3 R_5 Z_L g_m + C_3 R_3 Z_L + 2 C_5 R_3 R_5 Z_L g_m + C_5 R_3 R_5 + C_5 R_5 Z_L\right)}$$

Parameters:

Q: $\frac{C_3 C_5 R_3 R_5 Z_L \sqrt{\frac{g_m}{C_3 C_5 Z_L} + \frac{2 g_m}{C_3 C_5 R_5} + \frac{1}{C_3 C_5 R_5 Z_L} + \frac{g_m}{C_3 C_5 R_3} + \frac{1}{C_3 C_5 R_3 R_5}}}{C_3 R_3 R_5 Z_L g_m + C_3 R_3 Z_L + 2 C_5 R_3 R_5 Z_L g_m + C_5 R_3 R_5 + C_5 R_5 Z_L}$

wo: $\sqrt{\frac{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}{C_3 C_5 R_3 R_5 Z_L}}$

bandwidth: $\frac{\sqrt{\frac{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}{C_3 C_5 R_3 R_5 Z_L}}\left(C_3 R_3 R_5 Z_L g_m + C_3 R_3 Z_L + 2 C_5 R_3 R_5 Z_L g_m + C_5 R_3 R_5 + C_5 R_5 Z_L\right)}{C_3 C_5 R_3 R_5 Z_L \sqrt{\frac{g_m}{C_3 C_5 Z_L} + \frac{2 g_m}{C_3 C_5 R_5} + \frac{1}{C_3 C_5 R_5 Z_L} + \frac{g_m}{C_3 C_5 R_3} + \frac{1}{C_3 C_5 R_3 R_5}}}$

K-LP: $\frac{R_3 R_5 Z_L g_m - R_3 Z_L}{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}$

K-HP: 0

K-BP: $-\frac{C_5 R_3 R_5 Z_L}{C_3 R_3 R_5 Z_L g_m + C_3 R_3 Z_L + 2 C_5 R_3 R_5 Z_L g_m + C_5 R_3 R_5 + C_5 R_5 Z_L}$

Qz: None

Wz: None

8.6 INVALID-NUMER-6 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3}{C_3R_3s+1},\ \infty,\ R_5 + \frac{1}{C_5s}\right)$

$$H(s) = \frac{R_3Z_Lg_m + s\left(C_5R_3R_5Z_Lg_m - C_5R_3Z_L\right)}{R_3g_m + Z_Lg_m + s^2\left(C_3C_5R_3R_5Z_Lg_m + C_3C_5R_3Z_L\right) + s\left(C_3R_3Z_Lg_m + C_5R_3R_5g_m + 2C_5R_3Z_Lg_m + C_5R_3 + C_5R_5Z_Lg_m + C_5Z_L\right)}$$

Parameters:

Q: $\frac{C_3C_5R_3R_5Z_Lg_m\sqrt{\frac{R_3g_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}+\frac{Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}+C_3C_5R_3Z_L\sqrt{\frac{R_3g_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}+\frac{Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}}{C_3R_3Z_Lg_m+C_5R_3R_5g_m+2C_5R_3Z_Lg_m+C_5R_3+C_5R_5Z_Lg_m+C_5Z_L}$

wo: $\sqrt{\frac{R_3g_m+Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}$

bandwidth: $\frac{\sqrt{\frac{R_3g_m+Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}\left(C_3R_3Z_Lg_m+C_5R_3R_5g_m+2C_5R_3Z_Lg_m+C_5R_3+C_5R_5Z_Lg_m+C_5Z_L\right)}{C_3C_5R_3R_5Z_Lg_m\sqrt{\frac{R_3g_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}+\frac{Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}+C_3C_5R_3Z_L\sqrt{\frac{R_3g_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}+\frac{Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}}$

K-LP: $\frac{R_3Z_L}{R_3+Z_L}$

K-HP: 0

K-BP: $\frac{C_5R_3R_5Z_Lg_m\sqrt{\frac{g_m}{C_3C_5R_5Z_Lg_m+C_3C_5Z_L}+\frac{g_m}{C_3C_5R_3R_5g_m+C_3C_5R_3}}-C_5R_3Z_L\sqrt{\frac{g_m}{C_3C_5R_5Z_Lg_m+C_3C_5Z_L}+\frac{g_m}{C_3C_5R_3R_5g_m+C_3C_5R_3}}}{C_3R_3Z_Lg_m\sqrt{\frac{R_3g_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}+\frac{Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}+C_5R_3R_5g_m\sqrt{\frac{R_3g_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}+\frac{Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}+2C_5R_3Z_Lg_m\sqrt{\frac{R_3g_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}+\frac{Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}+C_5R_3\sqrt{\frac{R_3g_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}+\frac{Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}+C_5R_5Z_Lg_m\sqrt{\frac{R_3g_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}+\frac{Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}+C_5Z_L\sqrt{\frac{R_3g_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}+\frac{Z_Lg_m}{C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3Z_L}}}$

Qz: None

Wz: None

9 INVALID-WZ

9.1 INVALID-WZ-1 $Z(s) = \left(\infty,\ \infty,\ R_3 + \frac{1}{C_3s},\ \infty,\ \frac{1}{C_5s}\right)$

$$H(s) = \frac{-C_3C_5R_3Z_Ls^2 + Z_Lg_m + s\left(C_3R_3Z_Lg_m - C_5Z_L\right)}{g_m + s^2\left(2C_3C_5R_3Z_Lg_m + C_3C_5R_3 + C_3C_5Z_L\right) + s\left(C_3R_3g_m + C_3Z_Lg_m + 2C_5Z_Lg_m + C_5\right)}$$

Parameters:

Q: $\frac{2C_3C_5R_3Z_Lg_m\sqrt{\frac{g_m}{2C_3C_5R_3Z_Lg_m+C_3C_5R_3+C_3C_5Z_L}}+C_3C_5R_3\sqrt{\frac{g_m}{2C_3C_5R_3Z_Lg_m+C_3C_5R_3+C_3C_5Z_L}}+C_3C_5Z_L\sqrt{\frac{g_m}{2C_3C_5R_3Z_Lg_m+C_3C_5R_3+C_3C_5Z_L}}}{C_3R_3g_m+C_3Z_Lg_m+2C_5Z_Lg_m+C_5}$

wo: $\sqrt{\frac{g_m}{2C_3C_5R_3Z_Lg_m+C_3C_5R_3+C_3C_5Z_L}}$

bandwidth: $\frac{\sqrt{\frac{g_m}{2C_3C_5R_3Z_Lg_m+C_3C_5R_3+C_3C_5Z_L}}\left(C_3R_3g_m+C_3Z_Lg_m+2C_5Z_Lg_m+C_5\right)}{2C_3C_5R_3Z_Lg_m\sqrt{\frac{g_m}{2C_3C_5R_3Z_Lg_m+C_3C_5R_3+C_3C_5Z_L}}+C_3C_5R_3\sqrt{\frac{g_m}{2C_3C_5R_3Z_Lg_m+C_3C_5R_3+C_3C_5Z_L}}+C_3C_5Z_L\sqrt{\frac{g_m}{2C_3C_5R_3Z_Lg_m+C_3C_5R_3+C_3C_5Z_L}}}$

K-LP: Z_L

K-HP: $-\frac{R_3Z_L}{2R_3Z_Lg_m+R_3+Z_L}$

K-BP: $\frac{C_3R_3Z_Lg_m-C_5Z_L}{C_3R_3g_m+C_3Z_Lg_m+2C_5Z_Lg_m+C_5}$

Qz: None

Wz: $\sqrt{-\frac{g_m}{C_3C_5R_3}}$

9.2 INVALID-WZ-2 $Z(s) = \left(\infty,\ \infty,\ R_3 + \frac{1}{C_3s},\ \infty,\ \frac{R_5}{C_5R_5s+1}\right)$

$$H(s) = \frac{-C_3C_5R_3R_5Z_Ls^2 + R_5Z_Lg_m - Z_L + s\left(C_3R_3R_5Z_Lg_m - C_3R_3Z_L - C_5R_5Z_L\right)}{R_5g_m + 2Z_Lg_m + s^2\left(2C_3C_5R_3R_5Z_Lg_m + C_3C_5R_3R_5 + C_3C_5R_5Z_L\right) + s\left(C_3R_3R_5g_m + 2C_3R_3Z_Lg_m + C_3R_3 + C_3R_5Z_Lg_m + C_3Z_L + 2C_5R_5Z_Lg_m + C_5R_5\right) + 1}$$

Parameters:

Q: $\frac{2C_3C_5R_3R_5Z_Lg_m\sqrt{\frac{R_5g_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}+C_3C_5R_3R_5\sqrt{\frac{R_5g_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}+C_3C_5R_5Z_L\sqrt{\frac{2C_3C_5R_3R_5Z_Lg_m}{C_3R_3R_5g_m+2C_3R_3Z_Lg_m+C_3R_3+C_3R_5Z_Lg_m+C_3Z_L+2C_5R_5Z_Lg_m+C_5R_5}}$

wo: $\sqrt{\frac{R_5g_m+2Z_Lg_m+1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}$

bandwidth: $\frac{\sqrt{\frac{R_5g_m+2Z_Lg_m+1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}\left(C_3R_3R_5g_m+2C_3R_3Z_Lg_m+C_3R_3+C_3R_5Z_Lg_m+C_3Z_L+2C_5R_5Z_Lg_m+C_5R_5\right)}{2C_3C_5R_3R_5Z_Lg_m\sqrt{\frac{R_5g_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}+C_3C_5R_3R_5\sqrt{\frac{R_5g_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}+C_3C_5R_5Z_L\sqrt{\frac{2C_3C_5R_3R_5Z_Lg_m}{C_3R_3R_5g_m+2C_3R_3Z_Lg_m+C_3R_3+C_3R_5Z_Lg_m+C_3Z_L+2C_5R_5Z_Lg_m+C_5R_5}}}$

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

K-HP: $-\frac{R_3Z_L}{2R_3Z_Lg_m+R_3+Z_L}$

K-BP: $\frac{C_3R_3R_5Z_Lg_m\sqrt{\frac{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}{R_5g_m}}}{C_3R_3R_5g_m\sqrt{\frac{R_5g_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}+2C_3R_3Z_Lg_m\sqrt{\frac{R_5g_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}+C_3R_3\sqrt{\frac{R_5g_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}+C_3R_5Z_Lg_m\sqrt{\frac{R_5g_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}+C_3Z_L\sqrt{\frac{R_5g_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}+2C_5R_5Z_Lg_m\sqrt{\frac{R_5g_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}+C_5R_5\sqrt{\frac{R_5g_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{2Z_Lg_m}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}+\frac{1}{2C_3C_5R_3R_5Z_Lg_m+C_3C_5R_3R_5+C_3C_5R_5Z_L}}}$

Qz: None

Wz: $\sqrt{\frac{-R_5g_m+1}{C_3C_5R_3R_5}}$

9.3 INVALID-WZ-3 $Z(s) = \left(\infty,\ \infty,\ R_3 + \frac{1}{C_3 s},\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{Z_L g_m + s^2 \left(C_3 C_5 R_3 R_5 Z_L g_m - C_3 C_5 R_3 Z_L\right) + s \left(C_3 R_3 Z_L g_m + C_5 R_5 Z_L g_m - C_5 Z_L\right)}{g_m + s^2 \left(C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L\right) + s \left(C_3 R_3 g_m + C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right)}$$

Parameters:

Q: $\frac{C_3 C_5 R_3 R_5 g_m \sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}} + 2 C_3 C_5 R_3 Z_L g_m \sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}} + C_3 C_5 R_3 \sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}} + C_3 C_5 R_5 Z_L g_m \sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}} + C_3 C_5 Z_L \sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}}}{C_3 R_3 g_m + C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5}$

wo: $\sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}}$

bandwidth: $\frac{\sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}} \left(C_3 R_3 g_m + C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right)}{C_3 C_5 R_3 R_5 g_m \sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}} + 2 C_3 C_5 R_3 Z_L g_m \sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}} + C_3 C_5 R_3 \sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}} + C_3 C_5 R_5 Z_L g_m \sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}} + C_3 C_5 Z_L \sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L}}}$

K-LP: Z_L

K-HP: $\frac{R_3 R_5 Z_L g_m - R_3 Z_L}{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}$

K-BP: $\frac{C_3 R_3 Z_L g_m + C_5 R_5 Z_L g_m - C_5 Z_L}{C_3 R_3 g_m + C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5}$

Qz: None

Wz: $\sqrt{\frac{g_m}{C_3 C_5 R_3 R_5 g_m - C_3 C_5 R_3}}$

10 INVALID-ORDER

10.1 INVALID-ORDER-1 $Z(s) = (\infty,\ \infty,\ R_3,\ \infty,\ R_5)$

$$H(s) = \frac{R_3 R_5 Z_L g_m - R_3 Z_L}{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L}$$

10.2 INVALID-ORDER-2 $Z(s) = \left(\infty,\ \infty,\ R_3,\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_5 R_3 Z_L s + R_3 Z_L g_m}{R_3 g_m + Z_L g_m + s \left(2 C_5 R_3 Z_L g_m + C_5 R_3 + C_5 Z_L\right)}$$

10.3 INVALID-ORDER-3 $Z(s) = \left(\infty,\ \infty,\ R_3,\ \infty,\ \frac{R_5}{C_5 R_5 s + 1}\right)$

$$H(s) = \frac{-C_5 R_3 R_5 Z_L s + R_3 R_5 Z_L g_m - R_3 Z_L}{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L + s \left(2 C_5 R_3 R_5 Z_L g_m + C_5 R_3 R_5 + C_5 R_5 Z_L\right)}$$

10.4 INVALID-ORDER-4 $Z(s) = \left(\infty,\ \infty,\ R_3,\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{R_3 Z_L g_m + s \left(C_5 R_3 R_5 Z_L g_m - C_5 R_3 Z_L\right)}{R_3 g_m + Z_L g_m + s \left(C_5 R_3 R_5 g_m + 2 C_5 R_3 Z_L g_m + C_5 R_3 + C_5 R_5 Z_L g_m + C_5 Z_L\right)}$$

10.5 INVALID-ORDER-5 $Z(s) = \left(\infty,\ \infty,\ \frac{1}{C_3 s},\ \infty,\ R_5\right)$

$$H(s) = \frac{R_5 Z_L g_m - Z_L}{R_5 g_m + 2 Z_L g_m + s \left(C_3 R_5 Z_L g_m + C_3 Z_L\right) + 1}$$

10.6 INVALID-ORDER-6 $Z(s) = \left(\infty,\ \infty,\ \frac{1}{C_3 s},\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_5 L_5 Z_L g_m s^2 - C_5 Z_L s + Z_L g_m}{C_3 C_5 L_5 Z_L g_m s^3 + g_m + s^2 \left(C_3 C_5 Z_L + C_5 L_5 g_m\right) + s \left(C_3 Z_L g_m + 2 C_5 Z_L g_m + C_5\right)}$$

10.7 INVALID-ORDER-7 $Z(s) = \left(\infty,\ \infty,\ \frac{1}{C_3 s},\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1}\right)$

$$H(s) = \frac{-C_5 L_5 Z_L s^2 + L_5 Z_L g_m s - Z_L}{C_3 C_5 L_5 Z_L s^3 + 2 Z_L g_m + s^2 \left(C_3 L_5 Z_L g_m + 2 C_5 L_5 Z_L g_m + C_5 L_5\right) + s \left(C_3 Z_L + L_5 g_m\right) + 1}$$

10.8 INVALID-ORDER-8 $Z(s) = \left(\infty,\ \infty,\ \frac{1}{C_3 s},\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_5 L_5 Z_L g_m s^2 + Z_L g_m + s \left(C_5 R_5 Z_L g_m - C_5 Z_L\right)}{C_3 C_5 L_5 Z_L g_m s^3 + g_m + s^2 \left(C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L + C_5 L_5 g_m\right) + s \left(C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right)}$$

10.9 INVALID-ORDER-9 $Z(s) = \left(\infty,\ \infty,\ \frac{1}{C_3 s},\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5}\right)$

$$H(s) = \frac{-C_5 L_5 R_5 Z_L s^2 - R_5 Z_L + s \left(L_5 R_5 Z_L g_m - L_5 Z_L\right)}{C_3 C_5 L_5 R_5 Z_L s^3 + 2 R_5 Z_L g_m + R_5 + s^2 \left(C_3 L_5 R_5 Z_L g_m + C_3 L_5 Z_L + 2 C_5 L_5 R_5 Z_L g_m + C_5 L_5 R_5\right) + s \left(C_3 R_5 Z_L + L_5 R_5 g_m + 2 L_5 Z_L g_m + L_5\right)}$$

10.10 INVALID-ORDER-10 $Z(s) = \left(\infty,\ \infty,\ \frac{1}{C_3 s},\ \infty,\ \frac{C_5 L_5 R_5 s^2+L_5 s+R_5}{C_5 L_5 s^2+1}\right)$

$$H(s) = \frac{L_5 Z_L g_m s + R_5 Z_L g_m - Z_L + s^2 \left(C_5 L_5 R_5 Z_L g_m - C_5 L_5 Z_L\right)}{R_5 g_m + 2 Z_L g_m + s^3 \left(C_3 C_5 L_5 R_5 Z_L g_m + C_3 C_5 L_5 Z_L\right) + s^2 \left(C_3 L_5 Z_L g_m + C_5 L_5 R_5 g_m + 2 C_5 L_5 Z_L g_m + C_5 L_5\right) + s \left(C_3 R_5 Z_L g_m + C_3 Z_L + L_5 g_m\right) + 1}$$

10.11 INVALID-ORDER-11 $Z(s) = \left(\infty,\ \infty,\ \frac{1}{C_3 s},\ \infty,\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1}\right)$

$$H(s) = \frac{-C_5 R_5 Z_L s + R_5 Z_L g_m - Z_L + s^2 \left(C_5 L_5 R_5 Z_L g_m - C_5 L_5 Z_L\right)}{R_5 g_m + 2 Z_L g_m + s^3 \left(C_3 C_5 L_5 R_5 Z_L g_m + C_3 C_5 L_5 Z_L\right) + s^2 \left(C_3 C_5 R_5 Z_L + C_5 L_5 R_5 g_m + 2 C_5 L_5 Z_L g_m + C_5 L_5\right) + s \left(C_3 R_5 Z_L g_m + C_3 Z_L + 2 C_5 R_5 Z_L g_m + C_5 R_5\right) + 1}$$

10.12 INVALID-ORDER-12 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3}{C_3 R_3 s+1},\ \infty,\ R_5\right)$

$$H(s) = \frac{R_3 R_5 Z_L g_m - R_3 Z_L}{R_3 R_5 g_m + 2 R_3 Z_L g_m + R_3 + R_5 Z_L g_m + Z_L + s \left(C_3 R_3 R_5 Z_L g_m + C_3 R_3 Z_L\right)}$$

10.13 INVALID-ORDER-13 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3}{C_3 R_3 s+1},\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_5 L_5 R_3 Z_L g_m s^2 - C_5 R_3 Z_L s + R_3 Z_L g_m}{C_3 C_5 L_5 R_3 Z_L g_m s^3 + R_3 g_m + Z_L g_m + s^2 \left(C_3 C_5 R_3 Z_L + C_5 L_5 R_3 g_m + C_5 L_5 Z_L g_m\right) + s \left(C_3 R_3 Z_L g_m + 2 C_5 R_3 Z_L g_m + C_5 R_3 + C_5 Z_L\right)}$$

10.14 INVALID-ORDER-14 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3}{C_3 R_3 s+1},\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1}\right)$

$$H(s) = \frac{-C_5 L_5 R_3 Z_L s^2 + L_5 R_3 Z_L g_m s - R_3 Z_L}{C_3 C_5 L_5 R_3 Z_L s^3 + 2 R_3 Z_L g_m + R_3 + Z_L + s^2 \left(C_3 L_5 R_3 Z_L g_m + 2 C_5 L_5 R_3 Z_L g_m + C_5 L_5 R_3 + C_5 L_5 Z_L\right) + s \left(C_3 R_3 Z_L + L_5 R_3 g_m + L_5 Z_L g_m\right)}$$

10.15 INVALID-ORDER-15 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3}{C_3 R_3 s+1},\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_5 L_5 R_3 Z_L g_m s^2 + R_3 Z_L g_m + s \left(C_5 R_3 R_5 Z_L g_m - C_5 R_3 Z_L\right)}{C_3 C_5 L_5 R_3 Z_L g_m s^3 + R_3 g_m + Z_L g_m + s^2 \left(C_3 C_5 R_3 R_5 Z_L g_m + C_3 C_5 R_3 Z_L + C_5 L_5 R_3 g_m + C_5 L_5 Z_L g_m\right) + s \left(C_3 R_3 Z_L g_m + C_5 R_3 R_5 g_m + 2 C_5 R_3 Z_L g_m + C_5 R_3 + C_5 R_5 Z_L g_m + C_5 Z_L\right)}$$

10.16 INVALID-ORDER-16 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3}{C_3 R_3 s+1},\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5}\right)$

$$H(s) = \frac{-C_5 L_5 R_3 R_5 Z_L s^2 - R_3 R_5 Z_L + s \left(L_5 R_3 R_5 Z_L g_m - L_5 R_3 Z_L\right)}{C_3 C_5 L_5 R_3 R_5 Z_L s^3 + 2 R_3 R_5 Z_L g_m + R_3 R_5 + R_5 Z_L + s^2 \left(C_3 L_5 R_3 R_5 Z_L g_m + C_3 L_5 R_3 Z_L + 2 C_5 L_5 R_3 R_5 Z_L g_m + C_5 L_5 R_3 R_5 + C_5 L_5 R_5 Z_L\right) + s \left(C_3 R_3 R_5 Z_L + L_5 R_3 R_5 g_m + 2 L_5 R_3 Z_L g_m + L_5 R_3 + L_5 R_5 Z_L g_m + L_5 Z_L\right)}$$

10.17 INVALID-ORDER-17 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3}{C_3R_3s+1},\ \infty,\ \frac{C_5L_5R_5s^2+L_5s+R_5}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{L_5R_3Z_Lg_ms + R_3R_5Z_Lg_m - R_3Z_L + s^2\left(C_5L_5R_3R_5Z_Lg_m - C_5L_5R_3Z_L\right)}{R_3R_5g_m + 2R_3Z_Lg_m + R_3 + R_5Z_Lg_m + Z_L + s^3\left(C_3C_5L_5R_3R_5Z_Lg_m + C_3C_5L_5R_3Z_L\right) + s^2\left(C_3L_5R_3Z_Lg_m + C_5L_5R_3R_5g_m + 2C_5L_5R_3Z_Lg_m + C_5L_5R_3 + C_5L_5R_5Z_Lg_m + C_5L_5Z_L\right) + s\left(C_3R_3R_5Z_Lg_m + C_3R_3Z_L + L_5R_3g_m + L_5Z_Lg_m\right)}$$

10.18 INVALID-ORDER-18 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3}{C_3R_3s+1},\ \infty,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1}\right)$

$$H(s) = \frac{-C_5R_3R_5Z_Ls + R_3R_5Z_Lg_m - R_3Z_L + s^2\left(C_5L_5R_3R_5Z_Lg_m - C_5L_5R_3Z_L\right)}{R_3R_5g_m + 2R_3Z_Lg_m + R_3 + R_5Z_Lg_m + Z_L + s^3\left(C_3C_5L_5R_3R_5Z_Lg_m + C_3C_5L_5R_3Z_L\right) + s^2\left(C_3C_5R_3R_5Z_L + C_5L_5R_3R_5g_m + 2C_5L_5R_3Z_Lg_m + C_5L_5R_3 + C_5L_5R_5Z_Lg_m + C_5L_5Z_L\right) + s\left(C_3R_3R_5Z_Lg_m + C_3R_3Z_L + 2C_5R_3R_5Z_Lg_m + C_5R_3R_5 + C_5R_5Z_L\right)}$$

10.19 INVALID-ORDER-19 $Z(s) = \left(\infty,\ \infty,\ R_3 + \frac{1}{C_3s},\ \infty,\ R_5\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s\left(C_3R_3R_5Z_Lg_m - C_3R_3Z_L\right)}{R_5g_m + 2Z_Lg_m + s\left(C_3R_3R_5g_m + 2C_3R_3Z_Lg_m + C_3R_3 + C_3R_5Z_Lg_m + C_3Z_L\right) + 1}$$

10.20 INVALID-ORDER-20 $Z(s) = \left(\infty,\ \infty,\ R_3 + \frac{1}{C_3s},\ \infty,\ L_5s + \frac{1}{C_5s}\right)$

$$H(s) = \frac{C_3C_5L_5R_3Z_Lg_ms^3 + Z_Lg_m + s^2\left(-C_3C_5R_3Z_L + C_5L_5Z_Lg_m\right) + s\left(C_3R_3Z_Lg_m - C_5Z_L\right)}{g_m + s^3\left(C_3C_5L_5R_3g_m + C_3C_5L_5Z_Lg_m\right) + s^2\left(2C_3C_5R_3Z_Lg_m + C_3C_5R_3 + C_3C_5Z_L + C_5L_5g_m\right) + s\left(C_3R_3g_m + C_3Z_Lg_m + 2C_5Z_Lg_m + C_5\right)}$$

10.21 INVALID-ORDER-21 $Z(s) = \left(\infty,\ \infty,\ R_3 + \frac{1}{C_3s},\ \infty,\ \frac{L_5s}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{-C_3C_5L_5R_3Z_Ls^3 - Z_L + s^2\left(C_3L_5R_3Z_Lg_m - C_5L_5Z_L\right) + s\left(-C_3R_3Z_L + L_5Z_Lg_m\right)}{2Z_Lg_m + s^3\left(2C_3C_5L_5R_3Z_Lg_m + C_3C_5L_5R_3 + C_3C_5L_5Z_L\right) + s^2\left(C_3L_5R_3g_m + C_3L_5Z_Lg_m + 2C_5L_5Z_Lg_m + C_5L_5\right) + s\left(2C_3R_3Z_Lg_m + C_3R_3 + C_3Z_L + L_5g_m\right) + 1}$$

10.22 INVALID-ORDER-22 $Z(s) = \left(\infty,\ \infty,\ R_3 + \frac{1}{C_3s},\ \infty,\ L_5s + R_5 + \frac{1}{C_5s}\right)$

$$H(s) = \frac{C_3C_5L_5R_3Z_Lg_ms^3 + Z_Lg_m + s^2\left(C_3C_5R_3R_5Z_Lg_m - C_3C_5R_3Z_L + C_5L_5Z_Lg_m\right) + s\left(C_3R_3Z_Lg_m + C_5R_5Z_Lg_m - C_5Z_L\right)}{g_m + s^3\left(C_3C_5L_5R_3g_m + C_3C_5L_5Z_Lg_m\right) + s^2\left(C_3C_5R_3R_5g_m + 2C_3C_5R_3Z_Lg_m + C_3C_5R_3 + C_3C_5R_5Z_Lg_m + C_3C_5Z_L + C_5L_5g_m\right) + s\left(C_3R_3g_m + C_3Z_Lg_m + C_5R_5g_m + 2C_5Z_Lg_m + C_5\right)}$$

10.23 INVALID-ORDER-23 $Z(s) = \left(\infty,\ \infty,\ R_3 + \frac{1}{C_3s},\ \infty,\ \frac{L_5R_5s}{C_5L_5R_5s^2+L_5s+R_5}\right)$

$$H(s) = \frac{-C_3C_5L_5R_3R_5Z_Ls^3 - R_5Z_L + s^2\left(C_3L_5R_3R_5Z_Lg_m - C_3L_5R_3Z_L - C_5L_5R_5Z_L\right) + s\left(-C_3R_3R_5Z_L + L_5R_5Z_Lg_m - L_5Z_L\right)}{2R_5Z_Lg_m + R_5 + s^3\left(2C_3C_5L_5R_3R_5Z_Lg_m + C_3C_5L_5R_3R_5 + C_3C_5L_5R_5Z_L\right) + s^2\left(C_3L_5R_3R_5g_m + 2C_3L_5R_3Z_Lg_m + C_3L_5R_3 + C_3L_5R_5Z_Lg_m + C_3L_5Z_L + 2C_5L_5R_5Z_Lg_m + C_5L_5R_5\right) + s\left(2C_3R_3R_5Z_Lg_m + C_3R_3R_5 + C_3R_5Z_L + L_5R_5g_m + 2L_5Z_Lg_m + L_5\right)}$$

10.24 INVALID-ORDER-24 $Z(s) = \left(\infty,\ \infty,\ R_3 + \frac{1}{C_3s},\ \infty,\ \frac{C_5L_5R_5s^2+L_5s+R_5}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s^3\left(C_3C_5L_5R_3R_5Z_Lg_m - C_3C_5L_5R_3Z_L\right) + s^2\left(C_3L_5R_3Z_Lg_m + C_5L_5R_5Z_Lg_m - C_5L_5Z_L\right) + s\left(C_3R_3R_5Z_Lg_m - C_3R_3Z_L + L_5Z_Lg_m\right)}{R_5g_m + 2Z_Lg_m + s^3\left(C_3C_5L_5R_3R_5g_m + 2C_3C_5L_5R_3Z_Lg_m + C_3C_5L_5R_3 + C_3C_5L_5R_5Z_Lg_m + C_3C_5L_5Z_L\right) + s^2\left(C_3L_5R_3g_m + C_3L_5Z_Lg_m + C_5L_5R_5g_m + 2C_5L_5Z_Lg_m + C_5L_5\right) + s\left(C_3R_3R_5g_m + 2C_3R_3Z_Lg_m + C_3R_3 + C_3R_5Z_Lg_m + C_3Z_L + L_5g_m\right) + 1}$$

10.25 INVALID-ORDER-25 $Z(s) = \left(\infty,\ \infty,\ R_3 + \frac{1}{C_3s},\ \infty,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1}\right)$

$$H(s) = \frac{R_5Z_Lg_m - Z_L + s^3\left(C_3C_5L_5R_3R_5Z_Lg_m - C_3C_5L_5R_3Z_L\right) + s^2\left(-C_3C_5R_3R_5Z_L + C_5L_5R_5Z_Lg_m - C_5L_5Z_L\right) + s\left(C_3R_3R_5Z_Lg_m - C_3R_3Z_L - C_5R_5Z_L\right)}{R_5g_m + 2Z_Lg_m + s^3\left(C_3C_5L_5R_3R_5g_m + 2C_3C_5L_5R_3Z_Lg_m + C_3C_5L_5R_3 + C_3C_5L_5R_5Z_Lg_m + C_3C_5L_5Z_L\right) + s^2\left(2C_3C_5R_3R_5Z_Lg_m + C_3C_5R_3R_5 + C_3C_5R_5Z_L + C_5L_5R_5g_m + 2C_5L_5Z_Lg_m + C_5L_5\right) + s\left(C_3R_3R_5g_m + 2C_3R_3Z_Lg_m + C_3R_3 + C_3R_5Z_Lg_m + C_3Z_L\right.$$

10.26 INVALID-ORDER-26 $Z(s) = \left(\infty,\ \infty,\ L_3 s + \frac{1}{C_3 s},\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_3 C_5 L_3 Z_L s^3 + C_3 L_3 Z_L g_m s^2 - C_5 Z_L s + Z_L g_m}{g_m + s^3 \left(2 C_3 C_5 L_3 Z_L g_m + C_3 C_5 L_3\right) + s^2 \left(C_3 C_5 Z_L + C_3 L_3 g_m\right) + s \left(C_3 Z_L g_m + 2 C_5 Z_L g_m + C_5\right)}$$

10.27 INVALID-ORDER-27 $Z(s) = \left(\infty,\ \infty,\ L_3 s + \frac{1}{C_3 s},\ \infty,\ \frac{R_5}{C_5 R_5 s + 1}\right)$

$$H(s) = \frac{-C_3 C_5 L_3 R_5 Z_L s^3 - C_5 R_5 Z_L s + R_5 Z_L g_m - Z_L + s^2 \left(C_3 L_3 R_5 Z_L g_m - C_3 L_3 Z_L\right)}{R_5 g_m + 2 Z_L g_m + s^3 \left(2 C_3 C_5 L_3 R_5 Z_L g_m + C_3 C_5 L_3 R_5\right) + s^2 \left(C_3 C_5 R_5 Z_L + C_3 L_3 R_5 g_m + 2 C_3 L_3 Z_L g_m + C_3 L_3\right) + s \left(C_3 R_5 Z_L g_m + C_3 Z_L + 2 C_5 R_5 Z_L g_m + C_5 R_5\right) + 1}$$

10.28 INVALID-ORDER-28 $Z(s) = \left(\infty,\ \infty,\ L_3 s + \frac{1}{C_3 s},\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_3 L_3 Z_L g_m s^2 + Z_L g_m + s^3 \left(C_3 C_5 L_3 R_5 Z_L g_m - C_3 C_5 L_3 Z_L\right) + s \left(C_5 R_5 Z_L g_m - C_5 Z_L\right)}{g_m + s^3 \left(C_3 C_5 L_3 R_5 g_m + 2 C_3 C_5 L_3 Z_L g_m + C_3 C_5 L_3\right) + s^2 \left(C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L + C_3 L_3 g_m\right) + s \left(C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right)}$$

10.29 INVALID-ORDER-29 $Z(s) = \left(\infty,\ \infty,\ L_3 s + \frac{1}{C_3 s},\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_3 C_5 L_3 L_5 Z_L g_m s^4 - C_3 C_5 L_3 Z_L s^3 - C_5 Z_L s + Z_L g_m + s^2 \left(C_3 L_3 Z_L g_m + C_5 L_5 Z_L g_m\right)}{C_3 C_5 L_3 L_5 g_m s^4 + g_m + s^3 \left(2 C_3 C_5 L_3 Z_L g_m + C_3 C_5 L_3 + C_3 C_5 L_5 Z_L g_m\right) + s^2 \left(C_3 C_5 Z_L + C_3 L_3 g_m + C_5 L_5 g_m\right) + s \left(C_3 Z_L g_m + 2 C_5 Z_L g_m + C_5\right)}$$

10.30 INVALID-ORDER-30 $Z(s) = \left(\infty,\ \infty,\ L_3 s + \frac{1}{C_3 s},\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{-C_3 C_5 L_3 L_5 Z_L s^4 + C_3 L_3 L_5 Z_L g_m s^3 + L_5 Z_L g_m s - Z_L + s^2 \left(-C_3 L_3 Z_L - C_5 L_5 Z_L\right)}{2 Z_L g_m + s^4 \left(2 C_3 C_5 L_3 L_5 Z_L g_m + C_3 C_5 L_3 L_5\right) + s^3 \left(C_3 C_5 L_5 Z_L + C_3 L_3 L_5 g_m\right) + s^2 \left(2 C_3 L_3 Z_L g_m + C_3 L_3 + C_3 L_5 Z_L g_m + 2 C_5 L_5 Z_L g_m + C_5 L_5\right) + s \left(C_3 Z_L + L_5 g_m\right) + 1}$$

10.31 INVALID-ORDER-31 $Z(s) = \left(\infty,\ \infty,\ L_3 s + \frac{1}{C_3 s},\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_3 C_5 L_3 L_5 Z_L g_m s^4 + Z_L g_m + s^3 \left(C_3 C_5 L_3 R_5 Z_L g_m - C_3 C_5 L_3 Z_L\right) + s^2 \left(C_3 L_3 Z_L g_m + C_5 L_5 Z_L g_m\right) + s \left(C_5 R_5 Z_L g_m - C_5 Z_L\right)}{C_3 C_5 L_3 L_5 g_m s^4 + g_m + s^3 \left(C_3 C_5 L_3 R_5 g_m + 2 C_3 C_5 L_3 Z_L g_m + C_3 C_5 L_3 + C_3 C_5 L_5 Z_L g_m\right) + s^2 \left(C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L + C_3 L_3 g_m + C_5 L_5 g_m\right) + s \left(C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right)}$$

10.32 INVALID-ORDER-32 $Z(s) = \left(\infty,\ \infty,\ L_3 s + \frac{1}{C_3 s},\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5}\right)$

$$H(s) = \frac{-C_3 C_5 L_3 L_5 R_5 Z_L s^4 - R_5 Z_L + s^3 \left(C_3 L_3 L_5 R_5 Z_L g_m - C_3 L_3 L_5 Z_L\right) + s^2 \left(-C_3 L_3 R_5 Z_L - C_5 L_5 R_5 Z_L\right) + s \left(L_5 R_5 Z_L g_m - L_5 Z_L\right)}{2 R_5 Z_L g_m + R_5 + s^4 \left(2 C_3 C_5 L_3 L_5 R_5 Z_L g_m + C_3 C_5 L_3 L_5 R_5\right) + s^3 \left(C_3 C_5 L_5 R_5 Z_L + C_3 L_3 L_5 R_5 g_m + 2 C_3 L_3 L_5 Z_L g_m + C_3 L_3 L_5\right) + s^2 \left(2 C_3 L_3 R_5 Z_L g_m + C_3 L_3 R_5 + C_3 L_5 R_5 Z_L g_m + C_3 L_5 Z_L + 2 C_5 L_5 R_5 Z_L g_m + C_5 L_5 R_5\right) + s \left(C_3 R_5 Z_L + L_5 R_5 g_m + 2 L_5 Z_L g_m + L_5\right)}$$

10.33 INVALID-ORDER-33 $Z(s) = \left(\infty,\ \infty,\ L_3 s + \frac{1}{C_3 s},\ \infty,\ \frac{C_5 L_5 R_5 s^2 + L_5 s + R_5}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{C_3 L_3 L_5 Z_L g_m s^3 + L_5 Z_L g_m s + R_5 Z_L g_m - Z_L + s^4 \left(C_3 C_5 L_3 L_5 R_5 Z_L g_m - C_3 C_5 L_3 L_5 Z_L\right) + s^2 \left(C_3 L_3 R_5 Z_L g_m - C_3 L_3 Z_L + C_5 L_5 R_5 Z_L g_m - C_5 L_5 Z_L\right)}{R_5 g_m + 2 Z_L g_m + s^4 \left(C_3 C_5 L_3 L_5 R_5 g_m + 2 C_3 C_5 L_3 L_5 Z_L g_m + C_3 C_5 L_3 L_5\right) + s^3 \left(C_3 C_5 L_5 R_5 Z_L g_m + C_3 C_5 L_5 Z_L + C_3 L_3 L_5 g_m\right) + s^2 \left(C_3 L_3 R_5 g_m + 2 C_3 L_3 Z_L g_m + C_3 L_3 + C_3 L_5 Z_L g_m + C_5 L_5 R_5 g_m + 2 C_5 L_5 Z_L g_m + C_5 L_5\right) + s \left(C_3 R_5 Z_L g_m + C_3 Z_L + L_5 g_m\right) + 1}$$

10.34 INVALID-ORDER-34 $Z(s) = \left(\infty,\ \infty,\ L_3 s + \frac{1}{C_3 s},\ \infty,\ \frac{R_5\left(C_5 L_5 s^2 + 1\right)}{C_5 L_5 s^2 + C_5 R_5 s + 1}\right)$

$$H(s) = \frac{-C_3 C_5 L_3 R_5 Z_L s^3 - C_5 R_5 Z_L s + R_5 Z_L g_m - Z_L + s^4 \left(C_3 C_5 L_3 L_5 R_5 Z_L g_m - C_3 C_5 L_3 L_5 Z_L\right) + s^2 \left(C_3 L_3 R_5 Z_L g_m - C_3 L_3 Z_L + C_5 L_5 R_5 Z_L g_m - C_5 L_5 Z_L\right)}{R_5 g_m + 2 Z_L g_m + s^4 \left(C_3 C_5 L_3 L_5 R_5 g_m + 2 C_3 C_5 L_3 L_5 Z_L g_m + C_3 C_5 L_3 L_5\right) + s^3 \left(2 C_3 C_5 L_3 R_5 Z_L g_m + C_3 C_5 L_3 R_5 + C_3 C_5 L_5 R_5 Z_L g_m + C_3 C_5 L_5 Z_L\right) + s^2 \left(C_3 C_5 R_5 Z_L + C_3 L_3 R_5 g_m + 2 C_3 L_3 Z_L g_m + C_3 L_3 + C_5 L_5 R_5 g_m + 2 C_5 L_5 Z_L g_m + C_5 L_5\right) + s \left(C_3 R_5 Z_L g_m + C_3 Z\right.$$

10.35 INVALID-ORDER-35 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 s}{C_3 L_3 s^2+1},\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_5 L_3 Z_L s^2 + L_3 Z_L g_m s}{C_3 C_5 L_3 Z_L s^3 + Z_L g_m + s^2 \left(C_3 L_3 Z_L g_m + 2 C_5 L_3 Z_L g_m + C_5 L_3\right) + s \left(C_5 Z_L + L_3 g_m\right)}$$

10.36 INVALID-ORDER-36 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 s}{C_3 L_3 s^2+1},\ \infty,\ \frac{R_5}{C_5 R_5 s+1}\right)$

$$H(s) = \frac{-C_5 L_3 R_5 Z_L s^2 + s \left(L_3 R_5 Z_L g_m - L_3 Z_L\right)}{C_3 C_5 L_3 R_5 Z_L s^3 + R_5 Z_L g_m + Z_L + s^2 \left(C_3 L_3 R_5 Z_L g_m + C_3 L_3 Z_L + 2 C_5 L_3 R_5 Z_L g_m + C_5 L_3 R_5\right) + s \left(C_5 R_5 Z_L + L_3 R_5 g_m + 2 L_3 Z_L g_m + L_3\right)}$$

10.37 INVALID-ORDER-37 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 s}{C_3 L_3 s^2+1},\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{L_3 Z_L g_m s + s^2 \left(C_5 L_3 R_5 Z_L g_m - C_5 L_3 Z_L\right)}{Z_L g_m + s^3 \left(C_3 C_5 L_3 R_5 Z_L g_m + C_3 C_5 L_3 Z_L\right) + s^2 \left(C_3 L_3 Z_L g_m + C_5 L_3 R_5 g_m + 2 C_5 L_3 Z_L g_m + C_5 L_3\right) + s \left(C_5 R_5 Z_L g_m + C_5 Z_L + L_3 g_m\right)}$$

10.38 INVALID-ORDER-38 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 s}{C_3 L_3 s^2+1},\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_5 L_3 L_5 Z_L g_m s^3 - C_5 L_3 Z_L s^2 + L_3 Z_L g_m s}{C_3 C_5 L_3 L_5 Z_L g_m s^4 + Z_L g_m + s^3 \left(C_3 C_5 L_3 Z_L + C_5 L_3 L_5 g_m\right) + s^2 \left(C_3 L_3 Z_L g_m + 2 C_5 L_3 Z_L g_m + C_5 L_3 + C_5 L_5 Z_L g_m\right) + s \left(C_5 Z_L + L_3 g_m\right)}$$

10.39 INVALID-ORDER-39 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 s}{C_3 L_3 s^2+1},\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1}\right)$

$$H(s) = \frac{-C_5 L_3 L_5 Z_L s^3 + L_3 L_5 Z_L g_m s^2 - L_3 Z_L s}{C_3 C_5 L_3 L_5 Z_L s^4 + Z_L + s^3 \left(C_3 L_3 L_5 Z_L g_m + 2 C_5 L_3 L_5 Z_L g_m + C_5 L_3 L_5\right) + s^2 \left(C_3 L_3 Z_L + C_5 L_5 Z_L + L_3 L_5 g_m\right) + s \left(2 L_3 Z_L g_m + L_3 + L_5 Z_L g_m\right)}$$

10.40 INVALID-ORDER-40 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 s}{C_3 L_3 s^2+1},\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_5 L_3 L_5 Z_L g_m s^3 + L_3 Z_L g_m s + s^2 \left(C_5 L_3 R_5 Z_L g_m - C_5 L_3 Z_L\right)}{C_3 C_5 L_3 L_5 Z_L g_m s^4 + Z_L g_m + s^3 \left(C_3 C_5 L_3 R_5 Z_L g_m + C_3 C_5 L_3 Z_L + C_5 L_3 L_5 g_m\right) + s^2 \left(C_3 L_3 Z_L g_m + C_5 L_3 R_5 g_m + 2 C_5 L_3 Z_L g_m + C_5 L_3 + C_5 L_5 Z_L g_m\right) + s \left(C_5 R_5 Z_L g_m + C_5 Z_L + L_3 g_m\right)}$$

10.41 INVALID-ORDER-41 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 s}{C_3 L_3 s^2+1},\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2+L_5 s+R_5}\right)$

$$H(s) = \frac{-C_5 L_3 L_5 R_5 Z_L s^3 - L_3 R_5 Z_L s + s^2 \left(L_3 L_5 R_5 Z_L g_m - L_3 L_5 Z_L\right)}{C_3 C_5 L_3 L_5 R_5 Z_L s^4 + R_5 Z_L + s^3 \left(C_3 L_3 L_5 R_5 Z_L g_m + C_3 L_3 L_5 Z_L + 2 C_5 L_3 L_5 R_5 Z_L g_m + C_5 L_3 L_5 R_5\right) + s^2 \left(C_3 L_3 R_5 Z_L + C_5 L_5 R_5 Z_L + L_3 L_5 R_5 g_m + 2 L_3 L_5 Z_L g_m + L_3 L_5\right) + s \left(2 L_3 R_5 Z_L g_m + L_3 R_5 + L_5 R_5 Z_L g_m + L_5 Z_L\right)}$$

10.42 INVALID-ORDER-42 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 s}{C_3 L_3 s^2+1},\ \infty,\ \frac{C_5 L_5 R_5 s^2+L_5 s+R_5}{C_5 L_5 s^2+1}\right)$

$$H(s) = \frac{L_3 L_5 Z_L g_m s^2 + s^3 \left(C_5 L_3 L_5 R_5 Z_L g_m - C_5 L_3 L_5 Z_L\right) + s \left(L_3 R_5 Z_L g_m - L_3 Z_L\right)}{R_5 Z_L g_m + Z_L + s^4 \left(C_3 C_5 L_3 L_5 R_5 Z_L g_m + C_3 C_5 L_3 L_5 Z_L\right) + s^3 \left(C_3 L_3 L_5 Z_L g_m + C_5 L_3 L_5 R_5 g_m + 2 C_5 L_3 L_5 Z_L g_m + C_5 L_3 L_5\right) + s^2 \left(C_3 L_3 R_5 Z_L g_m + C_3 L_3 Z_L + C_5 L_5 R_5 Z_L g_m + C_5 L_5 Z_L + L_3 L_5 g_m\right) + s \left(L_3 R_5 g_m + 2 L_3 Z_L g_m + L_3 + L_5 Z_L g_m\right)}$$

10.43 INVALID-ORDER-43 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 s}{C_3 L_3 s^2+1},\ \infty,\ \frac{R_5\left(C_5 L_5 s^2+1\right)}{C_5 L_5 s^2+C_5 R_5 s+1}\right)$

$$H(s) = \frac{-C_5 L_3 R_5 Z_L s^2 + s^3 \left(C_5 L_3 L_5 R_5 Z_L g_m - C_5 L_3 L_5 Z_L\right) + s \left(L_3 R_5 Z_L g_m - L_3 Z_L\right)}{R_5 Z_L g_m + Z_L + s^4 \left(C_3 C_5 L_3 L_5 R_5 Z_L g_m + C_3 C_5 L_3 L_5 Z_L\right) + s^3 \left(C_3 C_5 L_3 R_5 Z_L + C_5 L_3 L_5 R_5 g_m + 2 C_5 L_3 L_5 Z_L g_m + C_5 L_3 L_5\right) + s^2 \left(C_3 L_3 R_5 Z_L g_m + C_3 L_3 Z_L + 2 C_5 L_3 R_5 Z_L g_m + C_5 L_3 R_5 + C_5 L_5 R_5 Z_L g_m + C_5 L_5 Z_L\right) + s \left(C_5 R_5 Z_L + L_3 R_5 g_m + 2 L_3 Z_L g_m + L_3\right)}$$

10.44 INVALID-ORDER-44 $Z(s) = \left(\infty,\ \infty,\ L_3 s + R_3 + \frac{1}{C_3 s},\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_3 C_5 L_3 Z_L s^3 + Z_L g_m + s^2 \left(-C_3 C_5 R_3 Z_L + C_3 L_3 Z_L g_m\right) + s \left(C_3 R_3 Z_L g_m - C_5 Z_L\right)}{g_m + s^3 \left(2 C_3 C_5 L_3 Z_L g_m + C_3 C_5 L_3\right) + s^2 \left(2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 Z_L + C_3 L_3 g_m\right) + s \left(C_3 R_3 g_m + C_3 Z_L g_m + 2 C_5 Z_L g_m + C_5\right)}$$

10.45 INVALID-ORDER-45 $Z(s) = \left(\infty,\ \infty,\ L_3 s + R_3 + \frac{1}{C_3 s},\ \infty,\ \frac{R_5}{C_5 R_5 s + 1}\right)$

$$H(s) = \frac{-C_3 C_5 L_3 R_5 Z_L s^3 + R_5 Z_L g_m - Z_L + s^2 \left(-C_3 C_5 R_3 R_5 Z_L + C_3 L_3 R_5 Z_L g_m - C_3 L_3 Z_L\right) + s \left(C_3 R_3 R_5 Z_L g_m - C_3 R_3 Z_L - C_5 R_5 Z_L\right)}{R_5 g_m + 2 Z_L g_m + s^3 \left(2 C_3 C_5 L_3 R_5 Z_L g_m + C_3 C_5 L_3 R_5\right) + s^2 \left(2 C_3 C_5 R_3 R_5 Z_L g_m + C_3 C_5 R_3 R_5 + C_3 C_5 R_5 Z_L + C_3 L_3 R_5 g_m + 2 C_3 L_3 Z_L g_m + C_3 L_3\right) + s \left(C_3 R_3 R_5 g_m + 2 C_3 R_3 Z_L g_m + C_3 R_3 + C_3 R_5 Z_L g_m + C_3 Z_L + 2 C_5 R_5 Z_L g_m + C_5 R_5\right) + 1}$$

10.46 INVALID-ORDER-46 $Z(s) = \left(\infty,\ \infty,\ L_3 s + R_3 + \frac{1}{C_3 s},\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{Z_L g_m + s^3 \left(C_3 C_5 L_3 R_5 Z_L g_m - C_3 C_5 L_3 Z_L\right) + s^2 \left(C_3 C_5 R_3 R_5 Z_L g_m - C_3 C_5 R_3 Z_L + C_3 L_3 Z_L g_m\right) + s \left(C_3 R_3 Z_L g_m + C_5 R_5 Z_L g_m - C_5 Z_L\right)}{g_m + s^3 \left(C_3 C_5 L_3 R_5 g_m + 2 C_3 C_5 L_3 Z_L g_m + C_3 C_5 L_3\right) + s^2 \left(C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L + C_3 L_3 g_m\right) + s \left(C_3 R_3 g_m + C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right)}$$

10.47 INVALID-ORDER-47 $Z(s) = \left(\infty,\ \infty,\ L_3 s + R_3 + \frac{1}{C_3 s},\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_3 C_5 L_3 L_5 Z_L g_m s^4 + Z_L g_m + s^3 \left(-C_3 C_5 L_3 Z_L + C_3 C_5 L_5 R_3 Z_L g_m\right) + s^2 \left(-C_3 C_5 R_3 Z_L + C_3 L_3 Z_L g_m + C_5 L_5 Z_L g_m\right) + s \left(C_3 R_3 Z_L g_m - C_5 Z_L\right)}{C_3 C_5 L_3 L_5 g_m s^4 + g_m + s^3 \left(2 C_3 C_5 L_3 Z_L g_m + C_3 C_5 L_3 + C_3 C_5 L_5 R_3 g_m + C_3 C_5 L_5 Z_L g_m\right) + s^2 \left(2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 Z_L + C_3 L_3 g_m + C_5 L_5 g_m\right) + s \left(C_3 R_3 g_m + C_3 Z_L g_m + 2 C_5 Z_L g_m + C_5\right)}$$

10.48 INVALID-ORDER-48 $Z(s) = \left(\infty,\ \infty,\ L_3 s + R_3 + \frac{1}{C_3 s},\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{-C_3 C_5 L_3 L_5 Z_L s^4 - Z_L + s^3 \left(-C_3 C_5 L_5 R_3 Z_L + C_3 L_3 L_5 Z_L g_m\right) + s^2 \left(-C_3 L_3 Z_L + C_3 L_5 R_3 Z_L g_m - C_5 L_5 Z_L\right) + s \left(-C_3 R_3 Z_L + L_5 Z_L g_m\right)}{2 Z_L g_m + s^4 \left(2 C_3 C_5 L_3 L_5 Z_L g_m + C_3 C_5 L_3 L_5\right) + s^3 \left(2 C_3 C_5 L_5 R_3 Z_L g_m + C_3 C_5 L_5 R_3 + C_3 C_5 L_5 Z_L + C_3 L_3 L_5 g_m\right) + s^2 \left(2 C_3 L_3 Z_L g_m + C_3 L_3 + C_3 L_5 R_3 g_m + C_3 L_5 Z_L g_m + 2 C_5 L_5 Z_L g_m + C_5 L_5\right) + s \left(2 C_3 R_3 Z_L g_m + C_3 R_3 + C_3 Z_L + L_5 g_m\right) + 1}$$

10.49 INVALID-ORDER-49 $Z(s) = \left(\infty,\ \infty,\ L_3 s + R_3 + \frac{1}{C_3 s},\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_3 C_5 L_3 L_5 Z_L g_m s^4 + Z_L g_m + s^3 \left(C_3 C_5 L_3 R_5 Z_L g_m - C_3 C_5 L_3 Z_L + C_3 C_5 L_5 R_3 Z_L g_m\right) + s^2 \left(C_3 C_5 R_3 R_5 Z_L g_m - C_3 C_5 R_3 Z_L + C_3 L_3 Z_L g_m + C_5 L_5 Z_L g_m\right) + s \left(C_3 R_3 Z_L g_m + C_5 R_5 Z_L g_m - C_5 Z_L\right)}{C_3 C_5 L_3 L_5 g_m s^4 + g_m + s^3 \left(C_3 C_5 L_3 R_5 g_m + 2 C_3 C_5 L_3 Z_L g_m + C_3 C_5 L_3 + C_3 C_5 L_5 R_3 g_m + C_3 C_5 L_5 Z_L g_m\right) + s^2 \left(C_3 C_5 R_3 R_5 g_m + 2 C_3 C_5 R_3 Z_L g_m + C_3 C_5 R_3 + C_3 C_5 R_5 Z_L g_m + C_3 C_5 Z_L + C_3 L_3 g_m + C_5 L_5 g_m\right) + s \left(C_3 R_3 g_m + C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right)}$$

10.50 INVALID-ORDER-50 $Z(s) = \left(\infty,\ \infty,\ L_3 s + R_3 + \frac{1}{C_3 s},\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5}\right)$

$$H(s) = \frac{-C_3 C_5 L_3 L_5 R_5 Z_L s^4 - R_5 Z_L + s^3 \left(-C_3 C_5 L_5 R_3 R_5 Z_L + C_3 L_3 L_5 R_5 Z_L g_m - C_3 L_3 L_5 Z_L\right) + s^2 \left(-C_3 L_3 R_5 Z_L + C_3 L_5 R_3 R_5 Z_L g_m - C_3 L_5 R_3 Z_L - C_5 L_5 R_5 Z_L\right) + s \left(-C_3 R_3 R_5 Z}{2 R_5 Z_L g_m + R_5 + s^4 \left(2 C_3 C_5 L_3 L_5 R_5 Z_L g_m + C_3 C_5 L_3 L_5 R_5\right) + s^3 \left(2 C_3 C_5 L_5 R_3 R_5 Z_L g_m + C_3 C_5 L_5 R_3 R_5 + C_3 C_5 L_5 R_5 Z_L + C_3 L_3 L_5 R_5 g_m + 2 C_3 L_3 L_5 Z_L g_m + C_3 L_3 L_5\right) + s^2 \left(2 C_3 L_3 R_5 Z_L g_m + C_3 L_3 R_5 + C_3 L_5 R_3 R_5 g_m + 2 C_3 L_5 R_3 Z_L g_m + C_3 L_5 R_3 + C_3 L_5 R_5 Z_L g_m}$$

10.51 INVALID-ORDER-51 $Z(s) = \left(\infty,\ \infty,\ L_3 s + R_3 + \frac{1}{C_3 s},\ \infty,\ \frac{C_5 L_5 R_5 s^2 + L_5 s + R_5}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{R_5 Z_L g_m - Z_L + s^4 \left(C_3 C_5 L_3 L_5 R_5 Z_L g_m - C_3 C_5 L_3 L_5 Z_L\right) + s^3 \left(C_3 C_5 L_5 R_3 R_5 Z_L g_m - C_3 C_5 L_5 R_3 Z_L + C_3 L_3 L_5 Z_L g_m\right) + s^2 \left(C_3 L_3 R_5 Z_L g_m - C_3 L_3 Z_L + C_3 L_5 R_3 Z_L g_m + C_5 L_5 R_5 Z_L g_m - C_5 L_5 Z_L\right) + s \left(C_3 R_3 R_5 Z_L g_m - C_3 R_3 Z_L + C_5 R_5 Z_L g_m - C_5 Z_L\right) + 1}{R_5 g_m + 2 Z_L g_m + s^4 \left(C_3 C_5 L_3 L_5 R_5 g_m + 2 C_3 C_5 L_3 L_5 Z_L g_m + C_3 C_5 L_3 L_5\right) + s^3 \left(C_3 C_5 L_5 R_3 R_5 g_m + 2 C_3 C_5 L_5 R_3 Z_L g_m + C_3 C_5 L_5 R_3 + C_3 C_5 L_5 R_5 Z_L g_m + C_3 C_5 L_5 Z_L + C_3 L_3 L_5 g_m\right) + s^2 \left(C_3 L_3 R_5 g_m + 2 C_3 L_3 Z_L g_m + C_3 L_3 + C_3 L_5 R_3 g_m + C_3 L_5 Z_L g_m + C_5 L_5 R_5 g_m\right) + s \left(C_3 R_3 g_m + C_3 Z_L g_m + C_5 R_5 g_m + 2 C_5 Z_L g_m + C_5\right) + 1}$$

10.52 INVALID-ORDER-52 $Z(s) = \left(\infty,\ \infty,\ L_3 s + R_3 + \frac{1}{C_3 s},\ \infty,\ \frac{R_5\left(C_5 L_5 s^2 + 1\right)}{C_5 L_5 s^2 + C_5 R_5 s + 1}\right)$

$$H(s) = \frac{R_5 Z_L g_m - Z_L + s^4 \left(C_3 C_5 L_3 L_5 R_5 Z_L g_m - C_3 C_5 L_3 L_5 Z_L\right) + s^3 \left(-C_3 C_5 L_3 R_5 Z_L + C_3 C_5 L_5 R_3 R_5 Z_L g_m - C_3 C_5 L_5 R_3 Z_L\right) + s^2 \left(-C_3 C_5 R_3 R_5 Z_L + C_3 L_3 R_5 Z_L g_m - C_3 L_3 Z_L + C}{R_5 g_m + 2 Z_L g_m + s^4 \left(C_3 C_5 L_3 L_5 R_5 g_m + 2 C_3 C_5 L_3 L_5 Z_L g_m + C_3 C_5 L_3 L_5\right) + s^3 \left(2 C_3 C_5 L_3 R_5 Z_L g_m + C_3 C_5 L_3 R_5 + C_3 C_5 L_5 R_3 R_5 g_m + 2 C_3 C_5 L_5 R_3 Z_L g_m + C_3 C_5 L_5 R_3 + C_3 C_5 L_5 R_5 Z_L + C_3 C_5 L_5 Z_L\right) + s^2 \left(2 C_3 C_5 R_3 R_5 Z_L g_m + C_3 C_5 R_3 R_5 + C_3 C_5 R_3 Z_L + C_3 L_3 R_5 Z_L g_m + C_3 L_3 Z_L + C\right.$$

10.53 INVALID-ORDER-53 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3},\ \infty,\ \frac{1}{C_5 s}\right)$

$$H(s) = \frac{-C_5 L_3 R_3 Z_L s^2 + L_3 R_3 Z_L g_m s}{C_3 C_5 L_3 R_3 Z_L s^3 + R_3 Z_L g_m + s^2 \left(C_3 L_3 R_3 Z_L g_m + 2 C_5 L_3 R_3 Z_L g_m + C_5 L_3 R_3 + C_5 L_3 Z_L\right) + s \left(C_5 R_3 Z_L + L_3 R_3 g_m + L_3 Z_L g_m\right)}$$

10.54 INVALID-ORDER-54 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3},\ \infty,\ \frac{R_5}{C_5 R_5 s + 1}\right)$

$$H(s) = \frac{-C_5 L_3 R_3 R_5 Z_L s^2 + s \left(L_3 R_3 R_5 Z_L g_m - L_3 R_3 Z_L\right)}{C_3 C_5 L_3 R_3 R_5 Z_L s^3 + R_3 R_5 Z_L g_m + R_3 Z_L + s^2 \left(C_3 L_3 R_3 R_5 Z_L g_m + C_3 L_3 R_3 Z_L + 2 C_5 L_3 R_3 R_5 Z_L g_m + C_5 L_3 R_3 R_5 + C_5 L_3 R_5 Z_L\right) + s \left(C_5 R_3 R_5 Z_L + L_3 R_3 R_5 g_m + 2 L_3 R_3 Z_L g_m + L_3 R_3 + L_3 R_5 Z_L g_m + L_3 Z_L\right)}$$

10.55 INVALID-ORDER-55 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3},\ \infty,\ R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{L_3 R_3 Z_L g_m s + s^2 \left(C_5 L_3 R_3 R_5 Z_L g_m - C_5 L_3 R_3 Z_L\right)}{R_3 Z_L g_m + s^3 \left(C_3 C_5 L_3 R_3 R_5 Z_L g_m + C_3 C_5 L_3 R_3 Z_L\right) + s^2 \left(C_3 L_3 R_3 Z_L g_m + C_5 L_3 R_3 R_5 g_m + 2 C_5 L_3 R_3 Z_L g_m + C_5 L_3 R_3 + C_5 L_3 R_5 Z_L g_m + C_5 L_3 Z_L\right) + s \left(C_5 R_3 R_5 Z_L g_m + C_5 R_3 Z_L + L_3 R_3 g_m + L_3 Z_L g_m\right)}$$

10.56 INVALID-ORDER-56 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3},\ \infty,\ L_5 s + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_5 L_3 L_5 R_3 Z_L g_m s^3 - C_5 L_3 R_3 Z_L s^2 + L_3 R_3 Z_L g_m s}{C_3 C_5 L_3 L_5 R_3 Z_L g_m s^4 + R_3 Z_L g_m + s^3 \left(C_3 C_5 L_3 R_3 Z_L + C_5 L_3 L_5 R_3 g_m + C_5 L_3 L_5 Z_L g_m\right) + s^2 \left(C_3 L_3 R_3 Z_L g_m + 2 C_5 L_3 R_3 Z_L g_m + C_5 L_3 R_3 + C_5 L_3 Z_L + C_5 L_5 R_3 Z_L g_m\right) + s \left(C_5 R_3 Z_L + L_3 R_3 g_m + L_3 Z_L g_m\right)}$$

10.57 INVALID-ORDER-57 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3},\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{-C_5 L_3 L_5 R_3 Z_L s^3 + L_3 L_5 R_3 Z_L g_m s^2 - L_3 R_3 Z_L s}{C_3 C_5 L_3 L_5 R_3 Z_L s^4 + R_3 Z_L + s^3 \left(C_3 L_3 L_5 R_3 Z_L g_m + 2 C_5 L_3 L_5 R_3 Z_L g_m + C_5 L_3 L_5 R_3 + C_5 L_3 L_5 Z_L\right) + s^2 \left(C_3 L_3 R_3 Z_L + C_5 L_5 R_3 Z_L + L_3 L_5 R_3 g_m + L_3 L_5 Z_L g_m\right) + s \left(2 L_3 R_3 Z_L g_m + L_3 R_3 + L_3 Z_L + L_5 R_3 Z_L g_m\right)}$$

10.58 INVALID-ORDER-58 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3},\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s}\right)$

$$H(s) = \frac{C_5 L_3 L_5 R_3 Z_L g_m s^3 + L_3 R_3 Z_L g_m s + s^2 \left(C_5 L_3 R_3 R_5 Z_L g_m - C_5 L_3 R_3 Z_L\right)}{C_3 C_5 L_3 L_5 R_3 Z_L g_m s^4 + R_3 Z_L g_m + s^3 \left(C_3 C_5 L_3 R_3 R_5 Z_L g_m + C_3 C_5 L_3 R_3 Z_L + C_5 L_3 L_5 R_3 g_m + C_5 L_3 L_5 Z_L g_m\right) + s^2 \left(C_3 L_3 R_3 Z_L g_m + C_5 L_3 R_3 R_5 g_m + 2 C_5 L_3 R_3 Z_L g_m + C_5 L_3 R_3 + C_5 L_3 R_5 Z_L g_m + C_5 L_3 Z_L + C_5 L_5 R_3 Z_L g_m\right) + s \left(C_5 R_3 R_5 Z_L g_m + C_5 R_3 Z_L + L_3 R_3 g\right.$$

10.59 INVALID-ORDER-59 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3},\ \infty,\ \frac{L_5 R_5 s}{C_5 L_5 R_5 s^2 + L_5 s + R_5}\right)$

$$H(s) = \frac{-C_5 L_3 L_5 R_3 R_5 Z_L s^3 - L_3 R_3 R_5 Z_L s + s^2 \left(L_3 L_5 R_3 R_5 Z_L g_m - L_3 L_5 R_3 Z_L\right)}{C_3 C_5 L_3 L_5 R_3 R_5 Z_L s^4 + R_3 R_5 Z_L + s^3 \left(C_3 L_3 L_5 R_3 R_5 Z_L g_m + C_3 L_3 L_5 R_3 Z_L + 2 C_5 L_3 L_5 R_3 R_5 Z_L g_m + C_5 L_3 L_5 R_3 R_5 + C_5 L_3 L_5 R_5 Z_L\right) + s^2 \left(C_3 L_3 R_3 R_5 Z_L + C_5 L_5 R_3 R_5 Z_L + L_3 L_5 R_3 R_5 g_m + 2 L_3 L_5 R_3 Z_L g_m + L_3 L_5 R_3 + L_3 L_5 R_5 Z_L g_m + L_3 L_5 Z_L\right) + s \left(2 L_3 R_3 R_5 Z_L\right.$$

10.60 INVALID-ORDER-60 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3},\ \infty,\ \frac{C_5 L_5 R_5 s^2 + L_5 s + R_5}{C_5 L_5 s^2 + 1}\right)$

$$H(s) = \frac{L_3 L_5 R_3 Z_L g_m s^2 + s^3 \left(C_5 L_3 L_5 R_3 R_5 Z_L g_m - C_5 L_3 L_5 R_3 Z_L\right) + s \left(L_3 R_3 R_5 Z_L g_m - L_3 R_3 Z_L\right)}{R_3 R_5 Z_L g_m + R_3 Z_L + s^4 \left(C_3 C_5 L_3 L_5 R_3 R_5 Z_L g_m + C_3 C_5 L_3 L_5 R_3 Z_L\right) + s^3 \left(C_3 L_3 L_5 R_3 Z_L g_m + C_5 L_3 L_5 R_3 R_5 g_m + 2 C_5 L_3 L_5 R_3 Z_L g_m + C_5 L_3 L_5 R_3 + C_5 L_3 L_5 R_5 Z_L g_m + C_5 L_3 L_5 Z_L\right) + s^2 \left(C_3 L_3 R_3 R_5 Z_L g_m + C_3 L_3 R_3 Z_L + C_5 L_5 R_3 R_5 Z_L g_m + C_5 L_5 R_3 Z_L + L_3 L_5 R_3\right.$$

10.61 INVALID-ORDER-61 $Z(s) = \left(\infty,\ \infty,\ \frac{L_3 R_3 s}{C_3 L_3 R_3 s^2 + L_3 s + R_3},\ \infty,\ \frac{R_5\left(C_5 L_5 s^2 + 1\right)}{C_5 L_5 s^2 + C_5 R_5 s + 1}\right)$

$$H(s) = \frac{-C_5 L_3 R_3 R_5 Z_L s^2 + s^3 \left(C_5 L_3 L_5 R_3 R_5 Z_L g_m - C_5 L_3 L_5 R_3 Z_L\right) + s \left(L_3 R_3 R_5 Z_L g_m - L_3 R_3 Z_L\right)}{R_3 R_5 Z_L g_m + R_3 Z_L + s^4 \left(C_3 C_5 L_3 L_5 R_3 R_5 Z_L g_m + C_3 C_5 L_3 L_5 R_3 Z_L\right) + s^3 \left(C_3 C_5 L_3 R_3 R_5 Z_L + C_5 L_3 L_5 R_3 R_5 g_m + 2 C_5 L_3 L_5 R_3 Z_L g_m + C_5 L_3 L_5 R_3 + C_5 L_3 L_5 R_5 Z_L g_m + C_5 L_3 L_5 Z_L\right) + s^2 \left(C_3 L_3 R_3 R_5 Z_L g_m + C_3 L_3 R_3 Z_L + 2 C_5 L_3 R_3 R_5 Z_L g_m + C_5 L_3 R_3 R_5 + C_5 L_3 R_3\right.$$

10.62 INVALID-ORDER-62 $Z(s) = \left(\infty,\ \infty,\ \frac{C_3L_3R_3s^2+L_3s+R_3}{C_3L_3s^2+1},\ \infty,\ \frac{1}{C_5s}\right)$

$$H(s) = \frac{-C_3C_5L_3R_3Z_Ls^3 + R_3Z_Lg_m + s^2\left(C_3L_3R_3Z_Lg_m - C_5L_3Z_L\right) + s\left(-C_5R_3Z_L + L_3Z_Lg_m\right)}{R_3g_m + Z_Lg_m + s^3\left(2C_3C_5L_3R_3Z_Lg_m + C_3C_5L_3R_3 + C_3C_5L_3Z_L\right) + s^2\left(C_3L_3R_3g_m + C_3L_3Z_Lg_m + 2C_5L_3Z_Lg_m + C_5L_3\right) + s\left(2C_5R_3Z_Lg_m + C_5R_3 + C_5Z_L + L_3g_m\right)}$$

10.63 INVALID-ORDER-63 $Z(s) = \left(\infty,\ \infty,\ \frac{C_3L_3R_3s^2+L_3s+R_3}{C_3L_3s^2+1},\ \infty,\ \frac{R_5}{C_5R_5s+1}\right)$

$$H(s) = \frac{-C_3C_5L_3R_3R_5Z_Ls^3 + R_3R_5Z_Lg_m - R_3Z_L + s^2\left(C_3L_3R_3R_5Z_Lg_m - C_3L_3R_3Z_L - C_5L_3R_5Z_L\right) + s\left(-C_5R_3R_5Z_L + L_3R_5Z_Lg_m - L_3Z_L\right)}{R_3R_5g_m + 2R_3Z_Lg_m + R_3 + R_5Z_Lg_m + Z_L + s^3\left(2C_3C_5L_3R_3R_5Z_Lg_m + C_3C_5L_3R_3R_5 + C_3C_5L_3R_5Z_L\right) + s^2\left(C_3L_3R_3R_5g_m + 2C_3L_3R_3Z_Lg_m + C_3L_3R_3 + C_3L_3R_5Z_Lg_m + C_3L_3Z_L + 2C_5L_3R_5Z_Lg_m + C_5L_3R_5\right) + s\left(2C_5R_3R_5Z_Lg_m + C_5R_3R_5 + C_5R_5Z_L + L_3\right.}$$

10.64 INVALID-ORDER-64 $Z(s) = \left(\infty,\ \infty,\ \frac{C_3L_3R_3s^2+L_3s+R_3}{C_3L_3s^2+1},\ \infty,\ R_5 + \frac{1}{C_5s}\right)$

$$H(s) = \frac{R_3Z_Lg_m + s^3\left(C_3C_5L_3R_3R_5Z_Lg_m - C_3C_5L_3R_3Z_L\right) + s^2\left(C_3L_3R_3Z_Lg_m + C_5L_3R_5Z_Lg_m - C_5L_3Z_L\right) + s\left(C_5R_3R_5Z_Lg_m - C_5R_3Z_L + L_3Z_Lg_m\right)}{R_3g_m + Z_Lg_m + s^3\left(C_3C_5L_3R_3R_5g_m + 2C_3C_5L_3R_3Z_Lg_m + C_3C_5L_3R_3 + C_3C_5L_3R_5Z_Lg_m + C_3C_5L_3Z_L\right) + s^2\left(C_3L_3R_3g_m + C_3L_3Z_Lg_m + C_5L_3R_5g_m + 2C_5L_3Z_Lg_m + C_5L_3\right) + s\left(C_5R_3R_5g_m + 2C_5R_3Z_Lg_m + C_5R_3 + C_5R_5Z_Lg_m + C_5Z_L + L_3g_m\right)}$$

10.65 INVALID-ORDER-65 $Z(s) = \left(\infty,\ \infty,\ \frac{C_3L_3R_3s^2+L_3s+R_3}{C_3L_3s^2+1},\ \infty,\ L_5s + \frac{1}{C_5s}\right)$

$$H(s) = \frac{C_3C_5L_3L_5R_3Z_Lg_ms^4 + R_3Z_Lg_m + s^3\left(-C_3C_5L_3R_3Z_L + C_5L_3L_5Z_Lg_m\right) + s^2\left(C_3L_3R_3Z_Lg_m - C_5L_3Z_L + C_5L_5R_3Z_Lg_m\right) + s\left(-C_5R_3Z_L + L_3Z_Lg_m\right)}{R_3g_m + Z_Lg_m + s^4\left(C_3C_5L_3L_5R_3g_m + C_3C_5L_3L_5Z_Lg_m\right) + s^3\left(2C_3C_5L_3R_3Z_Lg_m + C_3C_5L_3R_3 + C_3C_5L_3Z_L + C_5L_3L_5g_m\right) + s^2\left(C_3L_3R_3g_m + C_3L_3Z_Lg_m + 2C_5L_3Z_Lg_m + C_5L_3 + C_5L_5R_3g_m + C_5L_5Z_Lg_m\right) + s\left(2C_5R_3Z_Lg_m + C_5R_3 + C_5Z_L + L_3g_m\right)}$$

10.66 INVALID-ORDER-66 $Z(s) = \left(\infty,\ \infty,\ \frac{C_3L_3R_3s^2+L_3s+R_3}{C_3L_3s^2+1},\ \infty,\ \frac{L_5s}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{-C_3C_5L_3L_5R_3Z_Ls^4 - R_3Z_L + s^3\left(C_3L_3L_5R_3Z_Lg_m - C_5L_3L_5Z_L\right) + s^2\left(-C_3L_3R_3Z_L - C_5L_5R_3Z_L + L_3L_5Z_Lg_m\right) + s\left(-L_3Z_L + L_5R_3Z_Lg_m\right)}{2R_3Z_Lg_m + R_3 + Z_L + s^4\left(2C_3C_5L_3L_5R_3Z_Lg_m + C_3C_5L_3L_5R_3 + C_3C_5L_3L_5Z_L\right) + s^3\left(C_3L_3L_5R_3g_m + C_3L_3L_5Z_Lg_m + 2C_5L_3L_5Z_Lg_m + C_5L_3L_5\right) + s^2\left(2C_3L_3R_3Z_Lg_m + C_3L_3R_3 + C_3L_3Z_L + 2C_5L_5R_3Z_Lg_m + C_5L_5R_3 + C_5L_5Z_L + L_3L_5g_m\right) + s\left(2L_3Z_Lg_m + \right.}$$

10.67 INVALID-ORDER-67 $Z(s) = \left(\infty,\ \infty,\ \frac{C_3L_3R_3s^2+L_3s+R_3}{C_3L_3s^2+1},\ \infty,\ L_5s + R_5 + \frac{1}{C_5s}\right)$

$$H(s) = \frac{C_3C_5L_3L_5R_3Z_Lg_ms^4 + R_3Z_Lg_m + s^3\left(C_3C_5L_3R_3R_5Z_Lg_m - C_3C_5L_3R_3Z_L + C_5L_3L_5Z_Lg_m\right) + s^2\left(C_3L_3R_3Z_Lg_m + C_5L_3R_5Z_Lg_m - C_5L_3Z_L + C_5L_5R_3Z_Lg_m\right) + s\left(C_5R_3R_5Z_Lg_m - C_5R_3Z_L + L_3Z\right.}{R_3g_m + Z_Lg_m + s^4\left(C_3C_5L_3L_5R_3g_m + C_3C_5L_3L_5Z_Lg_m\right) + s^3\left(C_3C_5L_3R_3R_5g_m + 2C_3C_5L_3R_3Z_Lg_m + C_3C_5L_3R_3 + C_3C_5L_3R_5Z_Lg_m + C_3C_5L_3Z_L + C_5L_3L_5g_m\right) + s^2\left(C_3L_3R_3g_m + C_3L_3Z_Lg_m + C_5L_3R_5g_m + 2C_5L_3Z_Lg_m + C_5L_3 + C_5L_5R_3g_m + C_5L_5Z_Lg_m\right) + s\left(C_5R_3R_5g_m + 2C_5R_3Z_Lg_m + C_5R_3 + C_5R_5Z_Lg_m + C_5Z_L + L_3g_m\right) + 1}$$

10.68 INVALID-ORDER-68 $Z(s) = \left(\infty,\ \infty,\ \frac{C_3L_3R_3s^2+L_3s+R_3}{C_3L_3s^2+1},\ \infty,\ \frac{L_5R_5s}{C_5L_5R_5s^2+L_5s+R_5}\right)$

$$H(s) = \frac{-C_3C_5L_3L_5R_3R_5Z_Ls^4 - R_3R_5Z_L + s^3\left(C_3L_3L_5R_3R_5Z_Lg_m - C_3L_3L_5R_3Z_L - C_5L_3L_5R_5Z_L\right) + s^2\left(-C_3L_3R_3R_5Z_L - C_5L_5R_3R_5Z_L + L_3L\right.}{2R_3R_5Z_Lg_m + R_3R_5 + R_5Z_L + s^4\left(2C_3C_5L_3L_5R_3R_5Z_Lg_m + C_3C_5L_3L_5R_3R_5 + C_3C_5L_3L_5R_5Z_L\right) + s^3\left(C_3L_3L_5R_3R_5g_m + 2C_3L_3L_5R_3Z_Lg_m + C_3L_3L_5R_3 + C_3L_3L_5R_5Z_Lg_m + C_3L_3L_5Z_L + 2C_5L_3L_5R_5Z_Lg_m + C_5L_3L_5R_5\right) + s^2\left(2C_3L_3R_3R_5Z_Lg_m + C_3L_3R_3R\right.}$$

10.69 INVALID-ORDER-69 $Z(s) = \left(\infty,\ \infty,\ \frac{C_3L_3R_3s^2+L_3s+R_3}{C_3L_3s^2+1},\ \infty,\ \frac{C_5L_5R_5s^2+L_5s+R_5}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{R_3R_5Z_Lg_m - R_3Z_L + s^4\left(C_3C_5L_3L_5R_3R_5Z_Lg_m - C_3C_5L_3L_5R_3Z_L\right) + s^3\left(C_3L_3L_5R_3Z_Lg_m + C_5L_3L_5R_5Z_Lg_m - C_5L_3L_5Z_L\right) + s^2\left(C_3L_3R_3R_5Z_Lg_m - C_3L_3R_3Z_L\right.}{R_3R_5g_m + 2R_3Z_Lg_m + R_3 + R_5Z_Lg_m + Z_L + s^4\left(C_3C_5L_3L_5R_3R_5g_m + 2C_3C_5L_3L_5R_3Z_Lg_m + C_3C_5L_3L_5R_3 + C_3C_5L_3L_5R_5Z_Lg_m + C_3C_5L_3L_5Z_L\right) + s^3\left(C_3L_3L_5R_3g_m + C_3L_3L_5Z_Lg_m + C_5L_3L_5R_5g_m + 2C_5L_3L_5Z_Lg_m + C_5L_3L_5\right) + s^2\left(C_3L_3R_3R_5g_m + 2C_3L_3\right.}$$

10.70 INVALID-ORDER-70 $Z(s) = \left(\infty,\ \infty,\ \frac{C_3L_3R_3s^2+L_3s+R_3}{C_3L_3s^2+1},\ \infty,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1}\right)$

$$H(s) = \frac{R_3R_5Z_Lg_m - R_3Z_L + s^4\left(C_3C_5L_3L_5R_3R_5Z_Lg_m - C_3C_5L_3L_5R_3Z_L\right) + s^3\left(-C_3C_5L_3R_3R_5Z_L + C_5L_3L_5R_5Z_Lg_m - C_5L_3L_5Z_L\right) + s^2\left(\right.}{R_3R_5g_m + 2R_3Z_Lg_m + R_3 + R_5Z_Lg_m + Z_L + s^4\left(C_3C_5L_3L_5R_3R_5g_m + 2C_3C_5L_3L_5R_3Z_Lg_m + C_3C_5L_3L_5R_3 + C_3C_5L_3L_5R_5Z_Lg_m + C_3C_5L_3L_5Z_L\right) + s^3\left(2C_3C_5L_3R_3R_5Z_Lg_m + C_3C_5L_3R_3R_5 + C_3C_5L_3R_5Z_L + C_5L_3L_5R_5g_m + 2C_5L_3L_5Z_Lg_m + C_5L_3L_5\right) + s^2\left(\right.}$$

10.71 INVALID-ORDER-71 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3\left(C_3L_3s^2+1\right)}{C_3L_3s^2+C_3R_3s+1},\ \infty,\ \frac{1}{C_5s}\right)$

$$H(s) = \frac{-C_3C_5L_3R_3Z_Ls^3 + C_3L_3R_3Z_Lg_ms^2 - C_5R_3Z_Ls + R_3Z_Lg_m}{R_3g_m + Z_Lg_m + s^3\left(2C_3C_5L_3R_3Z_Lg_m + C_3C_5L_3R_3 + C_3C_5L_3Z_L\right) + s^2\left(C_3C_5R_3Z_L + C_3L_3R_3g_m + C_3L_3Z_Lg_m\right) + s\left(C_3R_3Z_Lg_m + 2C_5R_3Z_Lg_m + C_5R_3 + C_5Z_L\right)}$$

10.72 INVALID-ORDER-72 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3\left(C_3L_3s^2+1\right)}{C_3L_3s^2+C_3R_3s+1},\ \infty,\ \frac{R_5}{C_5R_5s+1}\right)$

$$H(s) = \frac{-C_3C_5L_3R_3R_5Z_Ls^3 - C_5R_3R_5Z_Ls + R_3R_5Z_Lg_m - R_3Z_L + s^2\left(C_3L_3R_3R_5Z_Lg_m - C_3L_3R_3Z_L\right)}{R_3R_5g_m + 2R_3Z_Lg_m + R_3 + R_5Z_Lg_m + Z_L + s^3\left(2C_3C_5L_3R_3R_5Z_Lg_m + C_3C_5L_3R_3R_5 + C_3C_5L_3R_5Z_L\right) + s^2\left(C_3C_5R_3R_5Z_L + C_3L_3R_3R_5g_m + 2C_3L_3R_3Z_Lg_m + C_3L_3R_3 + C_3L_3R_5Z_Lg_m + C_3L_3Z_L\right) + s\left(C_3R_3R_5Z_Lg_m + C_3R_3Z_L + 2C_5R_3R_5Z_Lg_m + C_5R_3R_5 + \right.}$$

10.73 INVALID-ORDER-73 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3\left(C_3L_3s^2+1\right)}{C_3L_3s^2+C_3R_3s+1},\ \infty,\ R_5 + \frac{1}{C_5s}\right)$

$$H(s) = \frac{C_3L_3R_3Z_Lg_ms^2 + R_3Z_Lg_m + s^3\left(C_3C_5L_3R_3R_5Z_Lg_m - C_3C_5L_3R_3Z_L\right) + s\left(C_5R_3R_5Z_Lg_m - C_5R_3Z_L\right)}{R_3g_m + Z_Lg_m + s^3\left(C_3C_5L_3R_3R_5g_m + 2C_3C_5L_3R_3Z_Lg_m + C_3C_5L_3R_3 + C_3C_5L_3R_5Z_Lg_m + C_3C_5L_3Z_L\right) + s^2\left(C_3C_5R_3R_5Z_Lg_m + C_3C_5R_3Z_L + C_3L_3R_3g_m + C_3L_3Z_Lg_m\right) + s\left(C_3R_3Z_Lg_m + C_5R_3R_5g_m + 2C_5R_3Z_Lg_m + C_5R_3 + C_5R_5Z_Lg_m + C_5Z_L\right)}$$

10.74 INVALID-ORDER-74 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3\left(C_3L_3s^2+1\right)}{C_3L_3s^2+C_3R_3s+1},\ \infty,\ L_5s + \frac{1}{C_5s}\right)$

$$H(s) = \frac{C_3C_5L_3L_5R_3Z_Lg_ms^4 - C_3C_5L_3R_3Z_Ls^3 - C_5R_3Z_Ls + R_3Z_Lg_m + s^2\left(C_3L_3R_3Z_Lg_m + C_5L_5R_3Z_Lg_m\right)}{R_3g_m + Z_Lg_m + s^4\left(C_3C_5L_3L_5R_3g_m + C_3C_5L_3L_5Z_Lg_m\right) + s^3\left(2C_3C_5L_3R_3Z_Lg_m + C_3C_5L_3R_3 + C_3C_5L_3Z_L + C_3C_5L_5R_3Z_Lg_m\right) + s^2\left(C_3C_5R_3Z_L + C_3L_3R_3g_m + C_3L_3Z_Lg_m + C_5L_5R_3g_m + C_5L_5Z_Lg_m\right) + s\left(C_3R_3Z_Lg_m + 2C_5R_3Z_Lg_m + C_5R_3 + C_5Z_L\right)}$$

10.75 INVALID-ORDER-75 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3\left(C_3L_3s^2+1\right)}{C_3L_3s^2+C_3R_3s+1},\ \infty,\ \frac{L_5s}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{-C_3C_5L_3L_5R_3Z_Ls^4 + C_3L_3L_5R_3Z_Lg_ms^3 + L_5R_3Z_Lg_ms - R_3Z_L + s^2\left(-C_3L_3R_3Z_L - C_5L_5R_3Z_L\right)}{2R_3Z_Lg_m + R_3 + Z_L + s^4\left(2C_3C_5L_3L_5R_3Z_Lg_m + C_3C_5L_3L_5R_3 + C_3C_5L_3L_5Z_L\right) + s^3\left(C_3C_5L_5R_3Z_L + C_3L_3L_5R_3g_m + 2C_3L_3L_5R_3Z_Lg_m + C_3L_3L_5R_3 + C_3L_3L_5Z_Lg_m + C_3L_3L_5Z_L\right) + s^2\left(2C_3L_3R_3Z_Lg_m + C_3L_3R_3 + C_3L_3Z_L + C_3L_5R_3Z_Lg_m + 2C_5L_5R_3Z_Lg_m + C_5L_5R_3 + C_5L_5Z_L\right) + s\left(C_3R_3Z_L + L_5R_3g\right.}$$

10.76 INVALID-ORDER-76 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3\left(C_3L_3s^2+1\right)}{C_3L_3s^2+C_3R_3s+1},\ \infty,\ L_5s + R_5 + \frac{1}{C_5s}\right)$

$$H(s) = \frac{C_3C_5L_3L_5R_3Z_Lg_ms^4 + R_3Z_Lg_m + s^3\left(C_3C_5L_3R_3R_5Z_Lg_m - C_3C_5L_3R_3Z_L\right) + s^2\left(C_3L_3R_3Z_Lg_m + C_5L_5R_3Z_Lg_m\right) + s\left(C_5R_3R_5Z_Lg_m - C_5R_3Z_L\right)}{R_3g_m + Z_Lg_m + s^4\left(C_3C_5L_3L_5R_3g_m + C_3C_5L_3L_5Z_Lg_m\right) + s^3\left(C_3C_5L_3R_3R_5g_m + 2C_3C_5L_3R_3Z_Lg_m + C_3C_5L_3R_3 + C_3C_5L_3R_5Z_Lg_m + C_3C_5L_3Z_L + C_3C_5L_5R_3Z_Lg_m\right) + s^2\left(C_3C_5R_3R_5Z_Lg_m + C_3C_5R_3Z_L + C_3L_3R_3g_m + C_3L_3Z_Lg_m + C_5L_5R_3g_m + C_5L_5Z_Lg_m\right.}$$

10.77 INVALID-ORDER-77 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3\left(C_3L_3s^2+1\right)}{C_3L_3s^2+C_3R_3s+1},\ \infty,\ \frac{L_5R_5s}{C_5L_5R_5s^2+L_5s+R_5}\right)$

$$H(s) = \frac{-C_3C_5L_3L_5R_3R_5Z_Ls^4 - R_3R_5Z_L + s^3\left(C_3L_3L_5R_3R_5Z_Lg_m - C_3L_3L_5R_3Z_L\right) + s^2\left(-C_3L_3R_3R_5Z_L - C_5L_5R_3R_5Z_L\right) + s\left(L_5\right.}{2R_3R_5Z_Lg_m + R_3R_5 + R_5Z_L + s^4\left(2C_3C_5L_3L_5R_3R_5Z_Lg_m + C_3C_5L_3L_5R_3R_5 + C_3C_5L_3L_5R_5Z_L\right) + s^3\left(C_3C_5L_5R_3R_5Z_L + C_3L_3L_5R_3R_5g_m + 2C_3L_3L_5R_3Z_Lg_m + C_3L_3L_5R_3 + C_3L_3L_5R_5Z_Lg_m + C_3L_3L_5Z_L\right) + s^2\left(2C_3L_3R_3R_5Z_Lg_m + C_3L_3R_3R_5 + C_3L_3R_5Z_L\right.}$$

10.78 INVALID-ORDER-78 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3\left(C_3L_3s^2+1\right)}{C_3L_3s^2+C_3R_3s+1},\ \infty,\ \frac{C_5L_5R_5s^2+L_5s+R_5}{C_5L_5s^2+1}\right)$

$$H(s) = \frac{C_3L_3L_5R_3Z_Lg_ms^3 + L_5R_3Z_Lg_ms + R_3R_5Z_Lg_m - R_3Z_L + s^4\left(C_3C_5L_3L_5R_3R_5Z_Lg_m - C_3C_5L_3L_5R_3Z_L\right) + s^2\left(C_3L_3R_3R_5Z_L\right.}{R_3R_5g_m + 2R_3Z_Lg_m + R_3 + R_5Z_Lg_m + Z_L + s^4\left(C_3C_5L_3L_5R_3R_5g_m + 2C_3C_5L_3L_5R_3Z_Lg_m + C_3C_5L_3L_5R_3 + C_3C_5L_3L_5R_5Z_Lg_m + C_3C_5L_3L_5Z_L\right) + s^3\left(C_3C_5L_5R_3R_5Z_Lg_m + C_3C_5L_5R_3Z_L + C_3L_3L_5R_3g_m + C_3L_3L_5Z_Lg_m\right) + s^2\left(C_3L_3R_3R_5g_m + 2C_3L_3R_3Z_Lg\right.}$$

10.79 INVALID-ORDER-79 $Z(s) = \left(\infty,\ \infty,\ \frac{R_3\left(C_3L_3s^2+1\right)}{C_3L_3s^2+C_3R_3s+1},\ \infty,\ \frac{R_5\left(C_5L_5s^2+1\right)}{C_5L_5s^2+C_5R_5s+1}\right)$

$$H(s) = \frac{-C_3C_5L_3R_3R_5Z_Ls^3 - C_5R_3R_5Z_Ls + R_3R_5Z_Lg_m - R_3Z_L + s^4\left(C_3C_5L_3L_5R_3R_5Z_Lg_m - C_3C_5L_3L_5R_3Z_L\right.}{R_3R_5g_m + 2R_3Z_Lg_m + R_3 + R_5Z_Lg_m + Z_L + s^4\left(C_3C_5L_3L_5R_3R_5g_m + 2C_3C_5L_3L_5R_3Z_Lg_m + C_3C_5L_3L_5R_3 + C_3C_5L_3L_5R_5Z_Lg_m + C_3C_5L_3L_5Z_L\right) + s^3\left(2C_3C_5L_3R_3R_5Z_Lg_m + C_3C_5L_3R_3R_5 + C_3C_5L_3R_5Z_L + C_3C_5L_5R_3R_5Z_Lg_m + C_3C_5L_5R_3Z_L\right) + s^2\left(C_3C_5\right.}$$

11 PolynomialError