Filter Summary Report: TIA,some,parasitic,Z5,ZL

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Contents

1 Examined $H(z)$ for TIA some parasitic Z5 ZL: $\frac{Z_L(Z_5 g_m r_o + Z_5 - r_o)}{Z_5 g_m r_o + Z_5 + 2Z_L g_m r_o + 4Z_L + r_o}$

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

2 HP

3 BP

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

$$H(s) = \frac{L_L s\left(R_5 g_m r_o + R_5 - r_o\right)}{C_L L_L R_5 g_m r_o s^2 + C_L L_L R_5 s^2 + C_L L_L r_o s^2 + 2L_L g_m r_o s + 4L_L s + R_5 g_m r_o + R_5 + r_o}$$

Parameters:

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

3.2 BP-2 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ R_5,\ \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}}\right)$

$$H(s) = \frac{L_L R_L s\left(R_5 g_m r_o + R_5 - r_o\right)}{C_L L_L R_5 R_L g_m r_o s^2 + C_L L_L R_5 R_L s^2 + C_L L_L R_L r_o s^2 + L_L R_5 g_m r_o s + L_L R_5 s + 2L_L R_L g_m r_o s + 4L_L R_L s + L_L r_o s + R_5 R_L g_m r_o + R_5 R_L + R_L r_o}$$

Parameters:

Q: $\frac{C_L R_L\sqrt{\frac{1}{C_L L_L}}(R_5 g_m r_o + R_5 + r_o)}{R_5 g_m r_o + R_5 + 2R_L g_m r_o + 4R_L + r_o}$
wo: $\sqrt{\frac{1}{C_L L_L}}$
bandwidth: $\frac{R_5 g_m r_o + R_5 + 2R_L g_m r_o + 4R_L + r_o}{C_L R_L(R_5 g_m r_o + R_5 + r_o)}$
K-LP: 0
K-HP: 0
K-BP: $\frac{R_L(R_5 g_m r_o + R_5 - r_o)}{R_5 g_m r_o + R_5 + 2R_L g_m r_o + 4R_L + r_o}$
Qz: 0
Wz: None

4 LP

5 BS

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

$$H(s) = \frac{\left(C_L L_L s^2 + 1\right)\left(R_5 g_m r_o + R_5 - r_o\right)}{2C_L L_L g_m r_o s^2 + 4C_L L_L s^2 + C_L R_5 g_m r_o s + C_L R_5 s + C_L r_o s + 2g_m r_o + 4}$$

Parameters:

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

5.2 BS-2 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ R_5,\ \frac{R_L\left(L_L s+\frac{1}{C_L s}\right)}{L_L s+R_L+\frac{1}{C_L s}}\right)$

$$H(s) = \frac{R_L\left(C_L L_L s^2 + 1\right)\left(R_5 g_m r_o + R_5 - r_o\right)}{C_L L_L R_5 g_m r_o s^2 + C_L L_L R_5 s^2 + 2C_L L_L R_L g_m r_o s^2 + 4C_L L_L R_L s^2 + C_L L_L r_o s^2 + C_L R_5 R_L g_m r_o s + C_L R_5 R_L s + C_L R_L r_o s + R_5 g_m r_o + R_5 + 2R_L g_m r_o + 4R_L + r_o}$$

Parameters:

Q: $\frac{L_L\sqrt{\frac{1}{C_L L_L}}(R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o)}{R_L(R_5 g_m r_o+R_5+r_o)}$
wo: $\sqrt{\frac{1}{C_L L_L}}$
bandwidth: $\frac{R_L(R_5 g_m r_o+R_5+r_o)}{L_L(R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o)}$
K-LP: $\frac{R_L(R_5 g_m r_o+R_5-r_o)}{R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o}$
K-HP: $\frac{R_L(R_5 g_m r_o+R_5-r_o)}{R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o}$
K-BP: 0
Qz: None
Wz: $\sqrt{\frac{1}{C_L L_L}}$

6 GE

6.1 GE-1 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ R_5,\ L_L s + R_L + \frac{1}{C_L s}\right)$

$$H(s) = \frac{\left(C_L L_L s^2 + C_L R_L s + 1\right)\left(R_5 g_m r_o + R_5 - r_o\right)}{2C_L L_L g_m r_o s^2 + 4C_L L_L s^2 + C_L R_5 g_m r_o s + C_L R_5 s + 2C_L R_L g_m r_o s + 4C_L R_L s + C_L r_o s + 2g_m r_o + 4}$$

Parameters:

Q: $\frac{2L_L\sqrt{\frac{1}{C_L L_L}}(g_m r_o+2)}{R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o}$
wo: $\sqrt{\frac{1}{C_L L_L}}$
bandwidth: $\frac{R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o}{2L_L(g_m r_o+2)}$
K-LP: $\frac{R_5 g_m r_o+R_5-r_o}{2(g_m r_o+2)}$
K-HP: $\frac{R_5 g_m r_o+R_5-r_o}{2(g_m r_o+2)}$
K-BP: $\frac{R_L(R_5 g_m r_o+R_5-r_o)}{R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o}$

Qz: $\frac{L_L\sqrt{\frac{1}{C_L L_L}}}{R_L}$
Wz: $\sqrt{\frac{1}{C_L L_L}}$

6.2 GE-2 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ R_5,\ \frac{L_L s}{C_L L_L s^2+1} + R_L\right)$

$$H(s) = \frac{(R_5 g_m r_o + R_5 - r_o)\left(C_L L_L R_L s^2 + L_L s + R_L\right)}{C_L L_L R_5 g_m r_o s^2 + C_L L_L R_5 s^2 + 2C_L L_L R_L g_m r_o s^2 + 4C_L L_L R_L s^2 + C_L L_L r_o s^2 + 2L_L g_m r_o s + 4L_L s + R_5 g_m r_o + R_5 + 2R_L g_m r_o + 4R_L + r_o}$$

Parameters:

Q: $\frac{C_L\sqrt{\frac{1}{C_L L_L}}(R_5 g_m r_o + R_5 + 2R_L g_m r_o + 4R_L + r_o)}{2(g_m r_o + 2)}$
wo: $\sqrt{\frac{1}{C_L L_L}}$
bandwidth: $\frac{2(g_m r_o + 2)}{C_L(R_5 g_m r_o + R_5 + 2R_L g_m r_o + 4R_L + r_o)}$
K-LP: $\frac{R_L(R_5 g_m r_o + R_5 - r_o)}{R_5 g_m r_o + R_5 + 2R_L g_m r_o + 4R_L + r_o}$
K-HP: $\frac{R_L(R_5 g_m r_o + R_5 - r_o)}{R_5 g_m r_o + R_5 + 2R_L g_m r_o + 4R_L + r_o}$
K-BP: $\frac{R_5 g_m r_o + R_5 - r_o}{2(g_m r_o + 2)}$
Qz: $C_L R_L\sqrt{\frac{1}{C_L L_L}}$
Wz: $\sqrt{\frac{1}{C_L L_L}}$

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

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

Parameters:

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

6.4 GE-4 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1},\ R_L\right)$

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

Parameters:

Q: $\frac{C_5\sqrt{\frac{1}{C_5 L_5}}(2R_L g_m r_o + 4R_L + r_o)}{g_m r_o + 1}$
wo: $\sqrt{\frac{1}{C_5 L_5}}$
bandwidth: $\frac{g_m r_o + 1}{C_5(2R_L g_m r_o + 4R_L + r_o)}$
K-LP: $-\frac{R_L r_o}{2R_L g_m r_o + 4R_L + r_o}$

K-HP: $-\frac{R_L r_o}{2R_L g_m r_o+4R_L+r_o}$
K-BP: R_L
Qz: $-\frac{C_5 r_o\sqrt{\frac{1}{C_5 L_5}}}{g_m r_o+1}$
Wz: $\sqrt{\frac{1}{C_5 L_5}}$

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

$$H(s)=\frac{R_L\left(C_5L_5g_mr_os^2+C_5L_5s^2+C_5R_5g_mr_os+C_5R_5s-C_5r_os+g_mr_o+1\right)}{C_5L_5g_mr_os^2+C_5L_5s^2+C_5R_5g_mr_os+C_5R_5s+2C_5R_Lg_mr_os+4C_5R_Ls+C_5r_os+g_mr_o+1}$$

Parameters:

Q: $\frac{L_5\sqrt{\frac{1}{C_5L_5}}(g_mr_o+1)}{R_5g_mr_o+R_5+2R_Lg_mr_o+4R_L+r_o}$
wo: $\sqrt{\frac{1}{C_5L_5}}$
bandwidth: $\frac{R_5g_mr_o+R_5+2R_Lg_mr_o+4R_L+r_o}{L_5(g_mr_o+1)}$
K-LP: R_L
K-HP: R_L
K-BP: $\frac{R_L(R_5g_mr_o+R_5-r_o)}{R_5g_mr_o+R_5+2R_Lg_mr_o+4R_L+r_o}$
Qz: $\frac{L_5\sqrt{\frac{1}{C_5L_5}}(g_mr_o+1)}{R_5g_mr_o+R_5-r_o}$
Wz: $\sqrt{\frac{1}{C_5L_5}}$

6.6 GE-6 $Z(s)=\left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s+\frac{1}{R_5}+\frac{1}{L_5 s}},\ R_L\right)$

$$H(s)=\frac{R_L\left(-C_5L_5R_5r_os^2+L_5R_5g_mr_os+L_5R_5s-L_5r_os-R_5r_o\right)}{2C_5L_5R_5R_Lg_mr_os^2+4C_5L_5R_5R_Ls^2+C_5L_5R_5r_os^2+L_5R_5g_mr_os+L_5R_5s+2L_5R_Lg_mr_os+4L_5R_Ls+L_5r_os+2R_5R_Lg_mr_o+4R_5R_L+R_5r_o}$$

Parameters:

Q: $\frac{C_5R_5\sqrt{\frac{1}{C_5L_5}}(2R_Lg_mr_o+4R_L+r_o)}{R_5g_mr_o+R_5+2R_Lg_mr_o+4R_L+r_o}$
wo: $\sqrt{\frac{1}{C_5L_5}}$
bandwidth: $\frac{R_5g_mr_o+R_5+2R_Lg_mr_o+4R_L+r_o}{C_5R_5(2R_Lg_mr_o+4R_L+r_o)}$
K-LP: $-\frac{R_Lr_o}{2R_Lg_mr_o+4R_L+r_o}$
K-HP: $-\frac{R_Lr_o}{2R_Lg_mr_o+4R_L+r_o}$
K-BP: $\frac{R_L(R_5g_mr_o+R_5-r_o)}{R_5g_mr_o+R_5+2R_Lg_mr_o+4R_L+r_o}$
Qz: $-\frac{C_5R_5r_o\sqrt{\frac{1}{C_5L_5}}}{R_5g_mr_o+R_5-r_o}$
Wz: $\sqrt{\frac{1}{C_5L_5}}$

6.7 GE-7 $Z(s)=\left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5L_5s^2+1}+R_5,\ R_L\right)$

$$H(s)=\frac{R_L\left(C_5L_5R_5g_mr_os^2+C_5L_5R_5s^2-C_5L_5r_os^2+L_5g_mr_os+L_5s+R_5g_mr_o+R_5-r_o\right)}{C_5L_5R_5g_mr_os^2+C_5L_5R_5s^2+2C_5L_5R_Lg_mr_os^2+4C_5L_5R_Ls^2+C_5L_5r_os^2+L_5g_mr_os+L_5s+R_5g_mr_o+R_5+2R_Lg_mr_o+4R_L+r_o}$$

Parameters:

Q: $\frac{C_5\sqrt{\frac{1}{C_5L_5}}(R_5g_mr_o+R_5+2R_Lg_mr_o+4R_L+r_o)}{g_mr_o+1}$
wo: $\sqrt{\frac{1}{C_5L_5}}$

bandwidth: $\frac{g_m r_o+1}{C_5(R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o)}$
K-LP: $\frac{R_L(R_5 g_m r_o+R_5-r_o)}{R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o}$
K-HP: $\frac{R_L(R_5 g_m r_o+R_5-r_o)}{R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o}$
K-BP: R_L
Qz: $\frac{C_5\sqrt{\frac{1}{C_5 L_5}}(R_5 g_m r_o+R_5-r_o)}{g_m r_o+1}$
Wz: $\sqrt{\frac{1}{C_5 L_5}}$

6.8 GE-8 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(L_5 s+\frac{1}{C_5 s}\right)}{L_5 s+R_5+\frac{1}{C_5 s}},\ R_L\right)$

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

Parameters:

Q: $\frac{L_5\sqrt{\frac{1}{C_5 L_5}}(R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o)}{R_5(2R_L g_m r_o+4R_L+r_o)}$
wo: $\sqrt{\frac{1}{C_5 L_5}}$
bandwidth: $\frac{R_5(2R_L g_m r_o+4R_L+r_o)}{L_5(R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o)}$
K-LP: $\frac{R_L(R_5 g_m r_o+R_5-r_o)}{R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o}$
K-HP: $\frac{R_L(R_5 g_m r_o+R_5-r_o)}{R_5 g_m r_o+R_5+2R_L g_m r_o+4R_L+r_o}$
K-BP: $-\frac{R_L r_o}{2R_L g_m r_o+4R_L+r_o}$
Qz: $\frac{L_5\sqrt{\frac{1}{C_5 L_5}}(-R_5 g_m r_o-R_5+r_o)}{R_5 r_o}$
Wz: $\sqrt{\frac{1}{C_5 L_5}}$

7 AP

8 INVALID-NUMER

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

$$H(s) = \frac{R_L\left(-C_5 r_o s+g_m r_o+1\right)}{C_5 C_L R_L r_o s^2+2C_5 R_L g_m r_o s+4C_5 R_L s+C_5 r_o s+C_L R_L g_m r_o s+C_L R_L s+g_m r_o+1}$$

Parameters:

Q: $\frac{C_5 C_L R_L r_o\sqrt{\frac{g_m r_o+1}{C_5 C_L R_L r_o}}}{2C_5 R_L g_m r_o+4C_5 R_L+C_5 r_o+C_L R_L g_m r_o+C_L R_L}$
wo: $\sqrt{\frac{g_m r_o+1}{C_5 C_L R_L r_o}}$
bandwidth: $\frac{2C_5 R_L g_m r_o+4C_5 R_L+C_5 r_o+C_L R_L g_m r_o+C_L R_L}{C_5 C_L R_L r_o}$
K-LP: R_L
K-HP: 0
K-BP: $-\frac{C_5 R_L r_o}{2C_5 R_L g_m r_o+4C_5 R_L+C_5 r_o+C_L R_L g_m r_o+C_L R_L}$
Qz: 0
Wz: None

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

$$H(s) = \frac{-C_5R_5r_os + R_5g_mr_o + R_5 - r_o}{C_5C_LR_5r_os^2 + 2C_5R_5g_mr_os + 4C_5R_5s + C_LR_5g_mr_os + C_LR_5s + C_Lr_os + 2g_mr_o + 4}$$

Parameters:

Q: $\frac{\sqrt{2}C_5C_LR_5r_o\sqrt{\frac{g_mr_o+2}{C_5C_LR_5r_o}}}{2C_5R_5g_mr_o+4C_5R_5+C_LR_5g_mr_o+C_LR_5+C_Lr_o}$
wo: $\sqrt{2}\sqrt{\frac{g_mr_o+2}{C_5C_LR_5r_o}}$
bandwidth: $\frac{2C_5R_5g_mr_o+4C_5R_5+C_LR_5g_mr_o+C_LR_5+C_Lr_o}{C_5C_LR_5r_o}$
K-LP: $\frac{R_5g_mr_o+R_5-r_o}{2(g_mr_o+2)}$
K-HP: 0
K-BP: $-\frac{C_5R_5r_o}{2C_5R_5g_mr_o+4C_5R_5+C_LR_5g_mr_o+C_LR_5+C_Lr_o}$
Qz: 0
Wz: None

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

$$H(s) = \frac{R_L\left(-C_5R_5r_os + R_5g_mr_o + R_5 - r_o\right)}{C_5C_LR_5R_Lr_os^2 + 2C_5R_5R_Lg_mr_os + 4C_5R_5R_Ls + C_5R_5r_os + C_LR_5R_Lg_mr_os + C_LR_5R_Ls + C_LR_Lr_os + R_5g_mr_o + R_5 + 2R_Lg_mr_o + 4R_L + r_o}$$

Parameters:

Q: $\frac{C_5C_LR_5R_Lr_o\sqrt{\frac{R_5g_mr_o+R_5+2R_Lg_mr_o+4R_L+r_o}{C_5C_LR_5R_Lr_o}}}{2C_5R_5R_Lg_mr_o+4C_5R_5R_L+C_5R_5r_o+C_LR_5R_Lg_mr_o+C_LR_5R_L+C_LR_Lr_o}$
wo: $\sqrt{\frac{R_5g_mr_o+R_5+2R_Lg_mr_o+4R_L+r_o}{C_5C_LR_5R_Lr_o}}$
bandwidth: $\frac{2C_5R_5R_Lg_mr_o+4C_5R_5R_L+C_5R_5r_o+C_LR_5R_Lg_mr_o+C_LR_5R_L+C_LR_Lr_o}{C_5C_LR_5R_Lr_o}$
K-LP: $\frac{R_L(R_5g_mr_o+R_5-r_o)}{R_5g_mr_o+R_5+2R_Lg_mr_o+4R_L+r_o}$
K-HP: 0
K-BP: $-\frac{C_5R_5R_Lr_o}{2C_5R_5R_Lg_mr_o+4C_5R_5R_L+C_5R_5r_o+C_LR_5R_Lg_mr_o+C_LR_5R_L+C_LR_Lr_o}$
Qz: 0
Wz: None

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

$$H(s) = \frac{R_L\left(C_5R_5g_mr_os + C_5R_5s - C_5r_os + g_mr_o + 1\right)}{C_5C_LR_5R_Lg_mr_os^2 + C_5C_LR_5R_Ls^2 + C_5C_LR_Lr_os^2 + C_5R_5g_mr_os + C_5R_5s + 2C_5R_Lg_mr_os + 4C_5R_Ls + C_5r_os + C_LR_Lg_mr_os + C_LR_Ls + g_mr_o + 1}$$

Parameters:

Q: $\frac{C_5C_LR_L\sqrt{\frac{g_mr_o+1}{C_5C_LR_L(R_5g_mr_o+R_5+r_o)}}(R_5g_mr_o+R_5+r_o)}{C_5R_5g_mr_o+C_5R_5+2C_5R_Lg_mr_o+4C_5R_L+C_5r_o+C_LR_Lg_mr_o+C_LR_L}$
wo: $\sqrt{\frac{g_mr_o+1}{C_5C_LR_L(R_5g_mr_o+R_5+r_o)}}$
bandwidth: $\frac{C_5R_5g_mr_o+C_5R_5+2C_5R_Lg_mr_o+4C_5R_L+C_5r_o+C_LR_Lg_mr_o+C_LR_L}{C_5C_LR_L(R_5g_mr_o+R_5+r_o)}$
K-LP: R_L
K-HP: 0
K-BP: $\frac{C_5R_L(R_5g_mr_o+R_5-r_o)}{C_5R_5g_mr_o+C_5R_5+2C_5R_Lg_mr_o+4C_5R_L+C_5r_o+C_LR_Lg_mr_o+C_LR_L}$
Qz: 0
Wz: None

9 INVALID-WZ

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

$$H(s) = -\frac{(C_LR_Ls+1)\left(C_5R_5r_os - R_5g_mr_o - R_5 + r_o\right)}{2C_5C_LR_5R_Lg_mr_os^2 + 4C_5C_LR_5R_Ls^2 + C_5C_LR_5r_os^2 + 2C_5R_5g_mr_os + 4C_5R_5s + C_LR_5g_mr_os + C_LR_5s + 2C_LR_Lg_mr_os + 4C_LR_Ls + C_Lr_os + 2g_mr_o + 4}$$

Parameters:

Q: $\frac{\sqrt{2}C_5C_LR_5\sqrt{\frac{g_mr_o+2}{C_5C_LR_5(2R_Lg_mr_o+4R_L+r_o)}}(2R_Lg_mr_o+4R_L+r_o)}{2C_5R_5g_mr_o+4C_5R_5+C_LR_5g_mr_o+C_LR_5+2C_LR_Lg_mr_o+4C_LR_L+C_Lr_o}$

wo: $\sqrt{2}\sqrt{\frac{g_mr_o+2}{C_5C_LR_5(2R_Lg_mr_o+4R_L+r_o)}}$

bandwidth: $\frac{2C_5R_5g_mr_o+4C_5R_5+C_LR_5g_mr_o+C_LR_5+2C_LR_Lg_mr_o+4C_LR_L+C_Lr_o}{C_5C_LR_5(2R_Lg_mr_o+4R_L+r_o)}$

K-LP: $\frac{R_5g_mr_o+R_5-r_o}{2(g_mr_o+2)}$

K-HP: $-\frac{R_Lr_o}{2R_Lg_mr_o+4R_L+r_o}$

K-BP: $\frac{-C_5R_5r_o+C_LR_5R_Lg_mr_o+C_LR_5R_L-C_LR_Lr_o}{2C_5R_5g_mr_o+4C_5R_5+C_LR_5g_mr_o+C_LR_5+2C_LR_Lg_mr_o+4C_LR_L+C_Lr_o}$

Qz: $\frac{\sqrt{2}C_5C_LR_5R_Lr_o\sqrt{\frac{g_mr_o+2}{C_5C_LR_5(2R_Lg_mr_o+4R_L+r_o)}}}{C_5R_5r_o-C_LR_5R_Lg_mr_o-C_LR_5R_L+C_LR_Lr_o}$

Wz: $\sqrt{\frac{-R_5g_mr_o-R_5+r_o}{C_5C_LR_5R_Lr_o}}$

10 INVALID-ORDER

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

$$H(s) = \frac{R_L\left(R_5g_mr_o + R_5 - r_o\right)}{R_5g_mr_o + R_5 + 2R_Lg_mr_o + 4R_L + r_o}$$

10.2 INVALID-ORDER-2 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ R_5,\ \frac{1}{C_Ls}\right)$

$$H(s) = \frac{R_5g_mr_o + R_5 - r_o}{C_LR_5g_mr_os + C_LR_5s + C_Lr_os + 2g_mr_o + 4}$$

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

$$H(s) = \frac{R_L\left(R_5g_mr_o + R_5 - r_o\right)}{C_LR_5R_Lg_mr_os + C_LR_5R_Ls + C_LR_Lr_os + R_5g_mr_o + R_5 + 2R_Lg_mr_o + 4R_L + r_o}$$

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

$$H(s) = \frac{(C_LR_Ls+1)\left(R_5g_mr_o + R_5 - r_o\right)}{C_LR_5g_mr_os + C_LR_5s + 2C_LR_Lg_mr_os + 4C_LR_Ls + C_Lr_os + 2g_mr_o + 4}$$

10.5 INVALID-ORDER-5 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5s},\ R_L\right)$

$$H(s) = \frac{R_L\left(-C_5r_os + g_mr_o + 1\right)}{2C_5R_Lg_mr_os + 4C_5R_Ls + C_5r_os + g_mr_o + 1}$$

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

$$H(s) = \frac{-C_5 r_o s + g_m r_o + 1}{s\left(C_5 C_L r_o s + 2C_5 g_m r_o + 4C_5 + C_L g_m r_o + C_L\right)}$$

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

$$H(s) = \frac{\left(C_L R_L s + 1\right)\left(-C_5 r_o s + g_m r_o + 1\right)}{s\left(2C_5 C_L R_L g_m r_o s + 4C_5 C_L R_L s + C_5 C_L r_o s + 2C_5 g_m r_o + 4C_5 + C_L g_m r_o + C_L\right)}$$

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

$$H(s) = \frac{\left(C_L L_L s^2 + 1\right)\left(-C_5 r_o s + g_m r_o + 1\right)}{s\left(2C_5 C_L L_L g_m r_o s^2 + 4C_5 C_L L_L s^2 + C_5 C_L r_o s + 2C_5 g_m r_o + 4C_5 + C_L g_m r_o + C_L\right)}$$

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

$$H(s) = \frac{L_L s\left(-C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_L r_o s^3 + 2C_5 L_L g_m r_o s^2 + 4C_5 L_L s^2 + C_5 r_o s + C_L L_L g_m r_o s^2 + C_L L_L s^2 + g_m r_o + 1}$$

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

$$H(s) = \frac{\left(-C_5 r_o s + g_m r_o + 1\right)\left(C_L L_L s^2 + C_L R_L s + 1\right)}{s\left(2C_5 C_L L_L g_m r_o s^2 + 4C_5 C_L L_L s^2 + 2C_5 C_L R_L g_m r_o s + 4C_5 C_L R_L s + C_5 C_L r_o s + 2C_5 g_m r_o + 4C_5 + C_L g_m r_o + C_L\right)}$$

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

$$H(s) = \frac{L_L R_L s\left(-C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_L R_L r_o s^3 + 2C_5 L_L R_L g_m r_o s^2 + 4C_5 L_L R_L s^2 + C_5 L_L r_o s^2 + C_5 R_L r_o s + C_L L_L R_L g_m r_o s^2 + C_L L_L R_L s^2 + L_L g_m r_o s + L_L s + R_L g_m r_o + R_L}$$

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

$$H(s) = \frac{\left(-C_5 r_o s + g_m r_o + 1\right)\left(C_L L_L R_L s^2 + L_L s + R_L\right)}{2C_5 C_L L_L R_L g_m r_o s^3 + 4C_5 C_L L_L R_L s^3 + C_5 C_L L_L r_o s^3 + 2C_5 L_L g_m r_o s^2 + 4C_5 L_L s^2 + 2C_5 R_L g_m r_o s + 4C_5 R_L s + C_5 r_o s + C_L L_L g_m r_o s^2 + C_L L_L s^2 + g_m r_o + 1}$$

10.13 INVALID-ORDER-13 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s},\ \frac{R_L\left(L_L s + \frac{1}{C_L s}\right)}{L_L s + R_L + \frac{1}{C_L s}}\right)$

$$H(s) = \frac{R_L\left(C_L L_L s^2 + 1\right)\left(-C_5 r_o s + g_m r_o + 1\right)}{2C_5 C_L L_L R_L g_m r_o s^3 + 4C_5 C_L L_L R_L s^3 + C_5 C_L L_L r_o s^3 + C_5 C_L R_L r_o s^2 + 2C_5 R_L g_m r_o s + 4C_5 R_L s + C_5 r_o s + C_L L_L g_m r_o s^2 + C_L L_L s^2 + C_L R_L g_m r_o s + C_L R_L s + g_m r_o + 1}$$

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

$$H(s) = \frac{R_L\left(-C_5 R_5 r_o s + R_5 g_m r_o + R_5 - r_o\right)}{2C_5 R_5 R_L g_m r_o s + 4C_5 R_5 R_L s + C_5 R_5 r_o s + R_5 g_m r_o + R_5 + 2R_L g_m r_o + 4R_L + r_o}$$

10.15 INVALID-ORDER-15 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5R_5s+1},\ L_Ls + \frac{1}{C_Ls}\right)$

$$H(s) = -\frac{\left(C_LL_Ls^2+1\right)\left(C_5R_5r_os - R_5g_mr_o - R_5 + r_o\right)}{2C_5C_LL_LR_5g_mr_os^3 + 4C_5C_LL_LR_5s^3 + C_5C_LR_5r_os^2 + 2C_5R_5g_mr_os + 4C_5R_5s + 2C_LL_Lg_mr_os^2 + 4C_LL_Ls^2 + C_LR_5g_mr_os + C_LR_5s + C_Lr_os + 2g_mr_o + 4}$$

10.16 INVALID-ORDER-16 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5R_5s+1},\ \frac{L_Ls}{C_LL_Ls^2+1}\right)$

$$H(s) = \frac{L_Ls\left(-C_5R_5r_os + R_5g_mr_o + R_5 - r_o\right)}{C_5C_LL_LR_5r_os^3 + 2C_5L_LR_5g_mr_os^2 + 4C_5L_LR_5s^2 + C_5R_5r_os + C_LL_LR_5g_mr_os^2 + C_LL_LR_5s^2 + C_LL_Lr_os^2 + 2L_Lg_mr_os + 4L_Ls + R_5g_mr_o + R_5 + r_o}$$

10.17 INVALID-ORDER-17 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5R_5s+1},\ L_Ls + R_L + \frac{1}{C_Ls}\right)$

$$H(s) = -\frac{\left(C_LL_Ls^2 + C_LR_Ls + 1\right)\left(C_5R_5r_os - R_5g_mr_o - R_5 + r_o\right)}{2C_5C_LL_LR_5g_mr_os^3 + 4C_5C_LL_LR_5s^3 + 2C_5C_LR_5R_Lg_mr_os^2 + 4C_5C_LR_5R_Ls^2 + C_5C_LR_5r_os^2 + 2C_5R_5g_mr_os + 4C_5R_5s + 2C_LL_Lg_mr_os^2 + 4C_LL_Ls^2 + C_LR_5g_mr_os + C_LR_5s + 2C_LR_Lg_mr_os + 4C_LR_Ls + C_Lr_os + 2g_mr_o + 4}$$

10.18 INVALID-ORDER-18 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5R_5s+1},\ \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}}\right)$

$$H(s) = \frac{L_LR_Ls\left(-C_5R_5r_os + R_5g_mr_o + R_5 - r_o\right)}{C_5C_LL_LR_5R_Lr_os^3 + 2C_5L_LR_5R_Lg_mr_os^2 + 4C_5L_LR_5R_Ls^2 + C_5L_LR_5r_os^2 + C_5R_5R_Lr_os + C_LL_LR_5R_Lg_mr_os^2 + C_LL_LR_5R_Ls^2 + C_LL_LR_Lr_os^2 + L_LR_5g_mr_os + L_LR_5s + 2L_LR_Lg_mr_os + 4L_LR_Ls + L_Lr_os + R_5R_Lg_mr_o + R_5R_L + R_Lr_o}$$

10.19 INVALID-ORDER-19 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5R_5s+1},\ \frac{L_Ls}{C_LL_Ls^2+1} + R_L\right)$

$$H(s) = -\frac{\left(C_LL_LR_Ls^2 + L_Ls + R_L\right)\left(C_5R_5r_os - R_5g_mr_o - R_5 + r_o\right)}{2C_5C_LL_LR_5R_Lg_mr_os^3 + 4C_5C_LL_LR_5R_Ls^3 + C_5C_LL_LR_5r_os^3 + 2C_5L_LR_5g_mr_os^2 + 4C_5L_LR_5s^2 + 2C_5R_5R_Lg_mr_os + 4C_5R_5R_Ls + C_5R_5r_os + C_LL_LR_5g_mr_os^2 + C_LL_LR_5s^2 + 2C_LL_LR_Lg_mr_os^2 + 4C_LL_LR_Ls^2 + C_LL_Lr_os^2 + 2L_Lg_mr_os + 4L_Ls + R_5g_m$$

10.20 INVALID-ORDER-20 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5}{C_5R_5s+1},\ \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$

$$H(s) = -\frac{R_L\left(C_LL_Ls^2+1\right)\left(C_5R_5r_os - R_5g_mr_o - R_5 + r_o\right)}{2C_5C_LL_LR_5R_Lg_mr_os^3 + 4C_5C_LL_LR_5R_Ls^3 + C_5C_LL_LR_5r_os^3 + C_5C_LR_5R_Lr_os^2 + 2C_5R_5R_Lg_mr_os + 4C_5R_5R_Ls + C_5R_5r_os + C_LL_LR_5g_mr_os^2 + C_LL_LR_5s^2 + 2C_LL_LR_Lg_mr_os^2 + 4C_LL_LR_Ls^2 + C_LL_Lr_os^2 + C_LR_5R_Lg_mr_os + C_LR_5R_Ls + C_LR_Lr_os -$$

10.21 INVALID-ORDER-21 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5s},\ R_L\right)$

$$H(s) = \frac{R_L\left(C_5R_5g_mr_os + C_5R_5s - C_5r_os + g_mr_o + 1\right)}{C_5R_5g_mr_os + C_5R_5s + 2C_5R_Lg_mr_os + 4C_5R_Ls + C_5r_os + g_mr_o + 1}$$

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

$$H(s) = \frac{C_5R_5g_mr_os + C_5R_5s - C_5r_os + g_mr_o + 1}{s\left(C_5C_LR_5g_mr_os + C_5C_LR_5s + C_5C_Lr_os + 2C_5g_mr_o + 4C_5 + C_Lg_mr_o + C_L\right)}$$

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

$$H(s) = \frac{\left(C_LR_Ls + 1\right)\left(C_5R_5g_mr_os + C_5R_5s - C_5r_os + g_mr_o + 1\right)}{s\left(C_5C_LR_5g_mr_os + C_5C_LR_5s + 2C_5C_LR_Lg_mr_os + 4C_5C_LR_Ls + C_5C_Lr_os + 2C_5g_mr_o + 4C_5 + C_Lg_mr_o + C_L\right)}$$

10.24 INVALID-ORDER-24 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ L_L s + \frac{1}{C_L s}\right)$

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

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

$$H(s) = \frac{L_L s\left(C_5 R_5 g_m r_o s + C_5 R_5 s - C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_L R_5 g_m r_o s^3 + C_5 C_L L_L R_5 s^3 + C_5 C_L L_L r_o s^3 + 2C_5 L_L g_m r_o s^2 + 4C_5 L_L s^2 + C_5 R_5 g_m r_o s + C_5 R_5 s + C_5 r_o s + C_L L_L g_m r_o s^2 + C_L L_L s^2 + g_m r_o + 1}$$

10.26 INVALID-ORDER-26 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ L_L s + R_L + \frac{1}{C_L s}\right)$

$$H(s) = \frac{\left(C_L L_L s^2 + C_L R_L s + 1\right)\left(C_5 R_5 g_m r_o s + C_5 R_5 s - C_5 r_o s + g_m r_o + 1\right)}{s\left(2C_5 C_L L_L g_m r_o s^2 + 4C_5 C_L L_L s^2 + C_5 C_L R_5 g_m r_o s + C_5 C_L R_5 s + 2C_5 C_L R_L g_m r_o s + 4C_5 C_L R_L s + C_5 C_L r_o s + 2C_5 g_m r_o + 4C_5 + C_L g_m r_o + C_L\right)}$$

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

$$H(s) = \frac{L_L R_L s\left(C_5 R_5 g_m r_o s + C_5 R_5 s - C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_L R_5 R_L g_m r_o s^3 + C_5 C_L L_L R_5 R_L s^3 + C_5 C_L L_L R_L r_o s^3 + C_5 L_L R_5 g_m r_o s^2 + C_5 L_L R_5 s^2 + 2C_5 L_L R_L g_m r_o s^2 + 4C_5 L_L R_L s^2 + C_5 L_L r_o s^2 + C_5 R_5 R_L g_m r_o s + C_5 R_5 R_L s + C_5 R_L r_o s + C_L L_L R_L g_m r_o s^2 + C_L L_L R_L s^2 + L_L g_m r_o s + L_L s + R_L g_m r_o + R_L}$$

10.28 INVALID-ORDER-28 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ R_5 + \frac{1}{C_5 s},\ \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$

$$H(s) = \frac{\left(C_L L_L R_L s^2 + L_L s + R_L\right)\left(C_5 R_5 g_m r_o s + C_5 R_5 s - C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_L R_5 g_m r_o s^3 + C_5 C_L L_L R_5 s^3 + 2C_5 C_L L_L R_L g_m r_o s^3 + 4C_5 C_L L_L R_L s^3 + C_5 C_L L_L r_o s^3 + 2C_5 L_L g_m r_o s^2 + 4C_5 L_L s^2 + C_5 R_5 g_m r_o s + C_5 R_5 s + 2C_5 R_L g_m r_o s + 4C_5 R_L s + C_5 r_o s + C_L L_L g_m r_o s^2 + C_L L_L s^2 + g_m r_o + 1}$$

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

$$H(s) = \frac{R_L\left(C_L L_L s^2 + 1\right)\left(C_5 R_5 g_m r_o s + C_5 R_5 s - C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_L R_5 g_m r_o s^3 + C_5 C_L L_L R_5 s^3 + 2C_5 C_L L_L R_L g_m r_o s^3 + 4C_5 C_L L_L R_L s^3 + C_5 C_L L_L r_o s^3 + C_5 C_L R_5 R_L g_m r_o s^2 + C_5 C_L R_5 R_L s^2 + C_5 C_L R_L r_o s^2 + C_5 R_5 g_m r_o s + C_5 R_5 s + 2C_5 R_L g_m r_o s + 4C_5 R_L s + C_5 r_o s + C_L L_L g_m r_o s^2 + C_L L_L s^2 + C_L R_L g_m r_o s + C_L$$

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

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

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

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

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

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

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

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

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

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

10.35 INVALID-ORDER-35 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ L_L s + R_L + \frac{1}{C_L s}\right)$

$$H(s) = \frac{\left(C_L L_L s^2 + C_L R_L s + 1\right)\left(C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 - C_5 r_o s + g_m r_o + 1\right)}{s\left(C_5 C_L L_5 g_m r_o s^2 + C_5 C_L L_5 s^2 + 2C_5 C_L L_L g_m r_o s^2 + 4C_5 C_L L_L s^2 + 2C_5 C_L R_L g_m r_o s + 4C_5 C_L R_L s + C_5 C_L r_o s + 2C_5 g_m r_o + 4C_5 + C_L g_m r_o + C_L\right)}$$

10.36 INVALID-ORDER-36 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}}\right)$

$$H(s) = \frac{L_L R_L s\left(C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 - C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_5 L_L R_L g_m r_o s^4 + C_5 C_L L_5 L_L R_L s^4 + C_5 C_L L_L R_L r_o s^3 + C_5 L_5 L_L g_m r_o s^3 + C_5 L_5 L_L s^3 + C_5 L_5 R_L g_m r_o s^2 + C_5 L_5 R_L s^2 + 2C_5 L_L R_L g_m r_o s^2 + 4C_5 L_L R_L s^2 + C_5 L_L r_o s^2 + C_5 R_L r_o s + C_L L_L R_L g_m r_o s^2 + C_L L_L R_L s^2 + L_L g_m r_o s + L_L s + R_L g_m r_o + R_L}$$

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

$$H(s) = \frac{\left(C_L L_L R_L s^2 + L_L s + R_L\right)\left(C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 - C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_5 L_L g_m r_o s^4 + C_5 C_L L_5 L_L s^4 + 2C_5 C_L L_L R_L g_m r_o s^3 + 4C_5 C_L L_L R_L s^3 + C_5 C_L L_L r_o s^3 + C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 + 2C_5 L_L g_m r_o s^2 + 4C_5 L_L s^2 + 2C_5 R_L g_m r_o s + 4C_5 R_L s + C_5 r_o s + C_L L_L g_m r_o s^2 + C_L L_L s^2 + g_m r_o + 1}$$

10.38 INVALID-ORDER-38 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ L_5 s + \frac{1}{C_5 s},\ \frac{R_L\left(L_L s + \frac{1}{C_L s}\right)}{L_L s + R_L + \frac{1}{C_L s}}\right)$

$$H(s) = \frac{R_L\left(C_L L_L s^2 + 1\right)\left(C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 - C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_5 L_L g_m r_o s^4 + C_5 C_L L_5 L_L s^4 + C_5 C_L L_5 R_L g_m r_o s^3 + C_5 C_L L_5 R_L s^3 + 2C_5 C_L L_L R_L g_m r_o s^3 + 4C_5 C_L L_L R_L s^3 + C_5 C_L L_L r_o s^3 + C_5 C_L R_L r_o s^2 + C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 + 2C_5 R_L g_m r_o s + 4C_5 R_L s + C_5 r_o s + C_L L_L g_m r_o s^2 + C_L L_L s^2 + C_L R_L g_m r_o s + C$$

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

$$H(s) = \frac{-C_5 L_5 r_o s^2 + L_5 g_m r_o s + L_5 s - r_o}{C_5 C_L L_5 r_o s^3 + 2C_5 L_5 g_m r_o s^2 + 4C_5 L_5 s^2 + C_L L_5 g_m r_o s^2 + C_L L_5 s^2 + C_L r_o s + 2g_m r_o + 4}$$

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

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

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

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

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

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

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

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

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

$$H(s) = -\frac{\left(C_L L_L s^2 + C_L R_L s + 1\right)\left(C_5 L_5 r_o s^2 - L_5 g_m r_o s - L_5 s + r_o\right)}{2C_5 C_L L_5 L_L g_m r_o s^4 + 4C_5 C_L L_5 L_L s^4 + 2C_5 C_L L_5 R_L g_m r_o s^3 + 4C_5 C_L L_5 R_L s^3 + C_5 C_L L_5 r_o s^3 + 2C_5 L_5 g_m r_o s^2 + 4C_5 L_5 s^2 + C_L L_5 g_m r_o s^2 + C_L L_5 s^2 + 2C_L L_L g_m r_o s^2 + 4C_L L_L s^2 + 2C_L R_L g_m r_o s + 4C_L R_L s + C_L r_o s + 2g_m r_o + 4}$$

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

$$H(s) = \frac{L_L R_L s\left(-C_5 L_5 r_o s^2 + L_5 g_m r_o s + L_5 s - r_o\right)}{C_5 C_L L_5 L_L R_L r_o s^4 + 2C_5 L_5 L_L R_L g_m r_o s^3 + 4C_5 L_5 L_L R_L s^3 + C_5 L_5 L_L r_o s^3 + C_5 L_5 R_L r_o s^2 + C_L L_5 L_L R_L g_m r_o s^3 + C_L L_5 L_L R_L s^3 + C_L L_L R_L r_o s^2 + L_5 L_L g_m r_o s^2 + L_5 L_L s^2 + L_5 R_L g_m r_o s + L_5 R_L s + 2L_L R_L g_m r_o s + 4L_L R_L s + L_L r_o s + R_L r_o}$$

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

$$H(s) = -\frac{\left(C_L L_L R_L s^2 + L_L s + R_L\right)\left(C_5 L_5 r_o s^2 - L_5 g_m r_o s - L_5 s + r_o\right)}{2C_5 C_L L_5 L_L R_L g_m r_o s^4 + 4C_5 C_L L_5 L_L R_L s^4 + C_5 C_L L_5 L_L r_o s^4 + 2C_5 L_5 L_L g_m r_o s^3 + 4C_5 L_5 L_L s^3 + 2C_5 L_5 R_L g_m r_o s^2 + 4C_5 L_5 R_L s^2 + C_5 L_5 r_o s^2 + C_L L_5 L_L g_m r_o s^3 + C_L L_5 L_L s^3 + 2C_L L_L R_L g_m r_o s^2 + 4C_L L_L R_L s^2 + C_L L_L r_o s^2 + L_5 g_m r_o s + L_5 s + 2L_L g_m$$

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

$$H(s) = -\frac{R_L\left(C_L L_L s^2 + 1\right)\left(C_5 L_5 r_o s^2 - L_5 g_m r_o s - L_5 s + r_o\right)}{2C_5 C_L L_5 L_L R_L g_m r_o s^4 + 4C_5 C_L L_5 L_L R_L s^4 + C_5 C_L L_5 L_L r_o s^4 + C_5 C_L L_5 R_L r_o s^3 + 2C_5 L_5 R_L g_m r_o s^2 + 4C_5 L_5 R_L s^2 + C_5 L_5 r_o s^2 + C_L L_5 L_L g_m r_o s^3 + C_L L_5 L_L s^3 + C_L L_5 R_L g_m r_o s^2 + C_L L_5 R_L s^2 + 2C_L L_L R_L g_m r_o s^2 + 4C_L L_L R_L s^2 + C_L L_L r_o s^2 + C_L R_L r$$

10.48 INVALID-ORDER-48 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \frac{1}{C_L s}\right)$

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

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

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

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

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

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

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

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

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

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

$$H(s) = \frac{\left(C_L L_L s^2 + C_L R_L s + 1\right)\left(C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 + C_5 R_5 g_m r_o s + C_5 R_5 s - C_5 r_o s + g_m r_o + 1\right)}{s\left(C_5 C_L L_5 g_m r_o s^2 + C_5 C_L L_5 s^2 + 2C_5 C_L L_L g_m r_o s^2 + 4C_5 C_L L_L s^2 + C_5 C_L R_5 g_m r_o s + C_5 C_L R_5 s + 2C_5 C_L R_L g_m r_o s + 4C_5 C_L R_L s + C_5 C_L r_o s + 2C_5 g_m r_o + 4C_5 + C_L g_m r_o + C_L\right)}$$

10.54 INVALID-ORDER-54 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}}\right)$

$$H(s) = \frac{L_L R_L s\left(C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 + C_5 R_5 g_m r_o s + C_5 R_5 s - C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_5 L_L R_L g_m r_o s^4 + C_5 C_L L_5 L_L R_L s^4 + C_5 C_L L_L R_5 R_L g_m r_o s^3 + C_5 C_L L_L R_5 R_L s^3 + C_5 C_L L_L R_L r_o s^3 + C_5 L_5 L_L g_m r_o s^3 + C_5 L_5 L_L s^3 + C_5 L_5 R_L g_m r_o s^2 + C_5 L_5 R_L s^2 + C_5 L_L R_5 g_m r_o s^2 + C_5 L_L R_5 s^2 + 2C_5 L_L R_L g_m r_o s^2 + 4C_5 L_L R_L s^2 + C_5 L_L r_o s^2 + C_5$$

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

$$H(s) = \frac{\left(C_L L_L R_L s^2 + L_L s + R_L\right)\left(C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 + C_5 R_5 g_m r_o s + C_5 R_5 s - C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_5 L_L g_m r_o s^4 + C_5 C_L L_5 L_L s^4 + C_5 C_L L_L R_5 g_m r_o s^3 + C_5 C_L L_L R_5 s^3 + 2C_5 C_L L_L R_L g_m r_o s^3 + 4C_5 C_L L_L R_L s^3 + C_5 C_L L_L r_o s^3 + C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 + 2C_5 L_L g_m r_o s^2 + 4C_5 L_L s^2 + C_5 R_5 g_m r_o s + C_5 R_5 s + 2C_5 R_L g_m r_o s + 4C_5 R_L s + C_5 r_o s + C_L L_L$$

10.56 INVALID-ORDER-56 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ L_5 s + R_5 + \frac{1}{C_5 s},\ \frac{R_L\left(L_L s + \frac{1}{C_L s}\right)}{L_L s + R_L + \frac{1}{C_L s}}\right)$

$$H(s) = \frac{R_L\left(C_L L_L s^2+1\right)\left(C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 + C_5 R_5 g_m r_o s + C_5 R_5 s - C_5 r_o s + g_m r_o + 1\right)}{C_5 C_L L_5 L_L g_m r_o s^4 + C_5 C_L L_5 L_L s^4 + C_5 C_L L_5 R_L g_m r_o s^3 + C_5 C_L L_5 R_L s^3 + C_5 C_L L_L R_5 g_m r_o s^3 + C_5 C_L L_L R_5 s^3 + 2C_5 C_L L_L R_L g_m r_o s^3 + 4C_5 C_L L_L R_L s^3 + C_5 C_L L_L r_o s^3 + C_5 C_L R_5 R_L g_m r_o s^2 + C_5 C_L R_5 R_L s^2 + C_5 C_L R_L r_o s^2 + C_5 L_5 g_m r_o s^2 + C_5 L_5 s^2 + C_5}$$

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

$$H(s) = \frac{-C_5 L_5 R_5 r_o s^2 + L_5 R_5 g_m r_o s + L_5 R_5 s - L_5 r_o s - R_5 r_o}{C_5 C_L L_5 R_5 r_o s^3 + 2C_5 L_5 R_5 g_m r_o s^2 + 4C_5 L_5 R_5 s^2 + C_L L_5 R_5 g_m r_o s^2 + C_L L_5 R_5 s^2 + C_L L_5 r_o s^2 + C_L R_5 r_o s + 2L_5 g_m r_o s + 4L_5 s + 2R_5 g_m r_o + 4R_5}$$

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

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

10.59 INVALID-ORDER-59 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s + \frac{1}{R_5} + \frac{1}{L_5 s}},\ R_L + \frac{1}{C_L s}\right)$

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

10.60 INVALID-ORDER-60 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s + \frac{1}{R_5} + \frac{1}{L_5 s}},\ L_L s + \frac{1}{C_L s}\right)$

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

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

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

10.62 INVALID-ORDER-62 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s + \frac{1}{R_5} + \frac{1}{L_5 s}},\ L_L s + R_L + \frac{1}{C_L s}\right)$

$$H(s) = -\frac{\left(C_L L_L s^2 + C_L R_L s + 1\right)\left(C_5 L_5 R_5 r_o s^2 - L_5 R_5 g_m r_o s - L_5 R_5 s + L_5 r_o s + R_5 r_o\right)}{2C_5 C_L L_5 L_L R_5 g_m r_o s^4 + 4C_5 C_L L_5 L_L R_5 s^4 + 2C_5 C_L L_5 R_5 R_L g_m r_o s^3 + 4C_5 C_L L_5 R_5 R_L s^3 + C_5 C_L L_5 R_5 r_o s^3 + 2C_5 L_5 R_5 g_m r_o s^2 + 4C_5 L_5 R_5 s^2 + 2C_L L_5 L_L g_m r_o s^3 + 4C_L L_5 L_L s^3 + C_L L_5 R_5 g_m r_o s^2 + C_L L_5 R_5 s^2 + 2C_L L_5 R_L g_m r_o s^2 + 4C_L L_5 R_L s^2 + C_L L_5 r}$$

10.63 INVALID-ORDER-63 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s + \frac{1}{R_5} + \frac{1}{L_5 s}},\ \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}}\right)$

$$H(s) = \frac{L_L R_L s\left(-C_5 L_5 R_5 r_o s^2 + L_5 R_5 g_m r_o s + L_5 R_5 s - L_5 r_o s - R_5 r_o\right)}{C_5 C_L L_5 L_L R_5 R_L r_o s^4 + 2C_5 L_5 L_L R_5 R_L g_m r_o s^3 + 4C_5 L_5 L_L R_5 R_L s^3 + C_5 L_5 L_L R_5 r_o s^3 + C_5 L_5 R_5 R_L r_o s^2 + C_L L_5 L_L R_5 R_L g_m r_o s^3 + C_L L_5 L_L R_5 R_L s^3 + C_L L_5 L_L R_L r_o s^3 + C_L L_L R_5 R_L r_o s^2 + L_5 L_L R_5 g_m r_o s^2 + L_5 L_L R_5 s^2 + 2L_5 L_L R_L g_m r_o s^2 + 4L_5 L_L R_L s^2}$$

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

$$H(s) = -\frac{\left(C_L L_L R_L s^2+L_L s+R_L\right)\left(C_5 L_5 R_5 r_o s^2-L_5 R_5 g_m r_o s-L_5}{2C_5C_L L_5 L_L R_5 R_L g_m r_o s^4+4C_5C_L L_5 L_L R_5 R_L s^4+C_5C_L L_5 L_L R_5 r_o s^4+2C_5 L_5 L_L R_5 g_m r_o s^3+4C_5 L_5 L_L R_5 s^3+2C_5 L_5 R_5 R_L g_m r_o s^2+4C_5 L_5 R_5 R_L s^2+C_5 L_5 R_5 r_o s^2+C_L L_5 L_L R_5 g_m r_o s^3+C_L L_5 L_L R_5 s^3+2C_L L_5 L_L R_L g_m r_o s^3+4C_L L_5 L_L R_L s^3+C_L L}$$

10.65 INVALID-ORDER-65 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_5 s+\frac{1}{R_5}+\frac{1}{L_5 s}},\ \frac{R_L\left(L_L s+\frac{1}{C_L s}\right)}{L_L s+R_L+\frac{1}{C_L s}}\right)$

$$H(s) = -\frac{R_L\left(C_L L_L s^2+1\right)\left(C_5 L_5 R_5 r_o s^2-L_5 R_5 g_m r_o s-L_5 R_5 s+}{2C_5C_L L_5 L_L R_5 R_L g_m r_o s^4+4C_5C_L L_5 L_L R_5 R_L s^4+C_5C_L L_5 L_L R_5 r_o s^4+C_5C_L L_5 R_5 R_L r_o s^3+2C_5 L_5 R_5 R_L g_m r_o s^2+4C_5 L_5 R_5 R_L s^2+C_5 L_5 R_5 r_o s^2+C_L L_5 L_L R_5 g_m r_o s^3+C_L L_5 L_L R_5 s^3+2C_L L_5 L_L R_L g_m r_o s^3+4C_L L_5 L_L R_L s^3+C_L L_5 L_L r_o s^3+C_L L_5 R}$$

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

$$H(s) = \frac{C_5 L_5 R_5 g_m r_o s^2+C_5 L_5 R_5 s^2-C_5 L_5 r_o s^2+L_5 g_m r_o s+L_5 s+R_5 g_m r_o+R_5-r_o}{C_5C_L L_5 R_5 g_m r_o s^3+C_5C_L L_5 R_5 s^3+C_5C_L L_5 r_o s^3+2C_5 L_5 g_m r_o s^2+4C_5 L_5 s^2+C_L L_5 g_m r_o s^2+C_L L_5 s^2+C_L R_5 g_m r_o s+C_L R_5 s+C_L r_o s+2g_m r_o+4}$$

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

$$H(s) = \frac{R_L\left(C_5 L_5 R_5 g_m r_o s^2+C_5 L_5 R_5 s^2-C_5 L_5 r_o s^2+L_5 g_m r_o s+L_5 s+R_5 g_m r_o+R_5-r_o\right)}{C_5C_L L_5 R_5 R_L g_m r_o s^3+C_5C_L L_5 R_5 R_L s^3+C_5C_L L_5 R_L r_o s^3+C_5 L_5 R_5 g_m r_o s^2+C_5 L_5 R_5 s^2+2C_5 L_5 R_L g_m r_o s^2+4C_5 L_5 R_L s^2+C_5 L_5 r_o s^2+C_L L_5 R_L g_m r_o s^2+C_L L_5 R_L s^2+C_L R_5 R_L g_m r_o s+C_L R_5 R_L s+C_L R_L r_o s+L_5 g_m r_o s+L_5 s+R_5 g_m r_o+R_5+2R}$$

10.68 INVALID-ORDER-68 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1}+R_5,\ R_L+\frac{1}{C_L s}\right)$

$$H(s) = \frac{\left(C_L R_L s+1\right)\left(C_5 L_5 R_5 g_m r_o s^2+C_5 L_5 R_5 s^2-C_5 L_5 r_o s^2+L_5 g_m r_o s+L_5 s+R_5 g_m r_o+R_5-r_o\right)}{C_5C_L L_5 R_5 g_m r_o s^3+C_5C_L L_5 R_5 s^3+2C_5C_L L_5 R_L g_m r_o s^3+4C_5C_L L_5 R_L s^3+C_5C_L L_5 r_o s^3+2C_5 L_5 g_m r_o s^2+4C_5 L_5 s^2+C_L L_5 g_m r_o s^2+C_L L_5 s^2+C_L R_5 g_m r_o s+C_L R_5 s+2C_L R_L g_m r_o s+4C_L R_L s+C_L r_o s+2g_m r_o+4}$$

10.69 INVALID-ORDER-69 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1}+R_5,\ L_L s+\frac{1}{C_L s}\right)$

$$H(s) = \frac{\left(C_L L_L s^2+1\right)\left(C_5 L_5 R_5 g_m r_o s^2+C_5 L_5 R_5 s^2-C_5 L_5 r_o s^2+L_5 g_m r_o s+L_5 s+R_5 g_m r_o+R_5-r_o\right)}{2C_5C_L L_5 L_L g_m r_o s^4+4C_5C_L L_5 L_L s^4+C_5C_L L_5 R_5 g_m r_o s^3+C_5C_L L_5 R_5 s^3+C_5C_L L_5 r_o s^3+2C_5 L_5 g_m r_o s^2+4C_5 L_5 s^2+C_L L_5 g_m r_o s^2+C_L L_5 s^2+2C_L L_L g_m r_o s^2+4C_L L_L s^2+C_L R_5 g_m r_o s+C_L R_5 s+C_L r_o s+2g_m r_o+4}$$

10.70 INVALID-ORDER-70 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1}+R_5,\ \frac{L_L s}{C_L L_L s^2+1}\right)$

$$H(s) = \frac{L_L s\left(C_5 L_5 R_5 g_m r_o s^2+C_5 L_5 R_5 s^2-C_5 L_5 r_o s^2+L_5 g_m r_o s+L_5 s+R_5 g_m r_o+R_5-r_o\right)}{C_5C_L L_5 L_L R_5 g_m r_o s^4+C_5C_L L_5 L_L R_5 s^4+C_5C_L L_5 L_L r_o s^4+2C_5 L_5 L_L g_m r_o s^3+4C_5 L_5 L_L s^3+C_5 L_5 R_5 g_m r_o s^2+C_5 L_5 R_5 s^2+C_5 L_5 r_o s^2+C_L L_5 L_L g_m r_o s^3+C_L L_5 L_L s^3+C_L L_L R_5 g_m r_o s^2+C_L L_L R_5 s^2+C_L L_L r_o s^2+L_5 g_m r_o s+L_5 s+2L_L g_m r_o s+4L_L s}$$

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

$$H(s) = \frac{\left(C_L L_L s^2+C_L R_L s+1\right)\left(C_5 L_5 R_5 g_m r_o s^2+C_5 L_5 R_5 s^2-C_5 L_5 r_o s^2+L_5 g_m r_o s+L_5 s+R_5 g_m r_o+R_5-r_o\right)}{2C_5C_L L_5 L_L g_m r_o s^4+4C_5C_L L_5 L_L s^4+C_5C_L L_5 R_5 g_m r_o s^3+C_5C_L L_5 R_5 s^3+2C_5C_L L_5 R_L g_m r_o s^3+4C_5C_L L_5 R_L s^3+C_5C_L L_5 r_o s^3+2C_5 L_5 g_m r_o s^2+4C_5 L_5 s^2+C_L L_5 g_m r_o s^2+C_L L_5 s^2+2C_L L_L g_m r_o s^2+4C_L L_L s^2+C_L R_5 g_m r_o s+C_L R_5 s+2C_L R_L g_m r_o}$$

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

$$H(s) = \frac{L_L R_L s \left(C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R_5 s^2 - C_5 L_5 r_o s^2 + L_5 g_m r_o s + L_5 s + R_5 \right.}{C_5 C_L L_5 L_L R_5 R_L g_m r_o s^4 + C_5 C_L L_5 L_L R_5 R_L s^4 + C_5 C_L L_5 L_L R_L r_o s^4 + C_5 L_5 L_L R_5 g_m r_o s^3 + C_5 L_5 L_L R_5 s^3 + 2C_5 L_5 L_L R_L g_m r_o s^3 + 4C_5 L_5 L_L R_L s^3 + C_5 L_5 L_L r_o s^3 + C_5 L_5 R_5 R_L g_m r_o s^2 + C_5 L_5 R_5 R_L s^2 + C_5 L_5 R_L r_o s^2 + C_L L_5 L_L R_L g_m r_o s^3 + C_L L_5 L_L R_L s^3$$

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

$$H(s) = \frac{\left(C_L L_L R_L s^2 + L_L s + R_L\right) \left(C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R_5 s^2 - C_5 L_5 r_o s^2 + L_5 g_m r_o s + L_5 s + R_5 g_m r_o + R_5 \right.}{C_5 C_L L_5 L_L R_5 g_m r_o s^4 + C_5 C_L L_5 L_L R_5 s^4 + 2C_5 C_L L_5 L_L R_L g_m r_o s^4 + 4C_5 C_L L_5 L_L R_L s^4 + C_5 C_L L_5 L_L r_o s^4 + 2C_5 L_5 L_L g_m r_o s^3 + 4C_5 L_5 L_L s^3 + C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R_5 s^2 + 2C_5 L_5 R_L g_m r_o s^2 + 4C_5 L_5 R_L s^2 + C_5 L_5 r_o s^2 + C_L L_5 L_L g_m r_o s^3 + C_L L_5 L_L s^3 + C$$

10.74 INVALID-ORDER-74 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_5 s}{C_5 L_5 s^2+1} + R_5,\ \frac{R_L\left(L_L s + \frac{1}{C_L s}\right)}{L_L s + R_L + \frac{1}{C_L s}}\right)$

$$H(s) = \frac{R_L \left(C_L L_L s^2 + 1\right) \left(C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R_5 s^2 - C_5 L_5 \right.}{C_5 C_L L_5 L_L R_5 g_m r_o s^4 + C_5 C_L L_5 L_L R_5 s^4 + 2C_5 C_L L_5 L_L R_L g_m r_o s^4 + 4C_5 C_L L_5 L_L R_L s^4 + C_5 C_L L_5 L_L r_o s^4 + C_5 C_L L_5 R_5 R_L g_m r_o s^3 + C_5 C_L L_5 R_5 R_L s^3 + C_5 C_L L_5 R_L r_o s^3 + C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R_5 s^2 + 2C_5 L_5 R_L g_m r_o s^2 + 4C_5 L_5 R_L s^2 + C_5 L_5 r_o s^2 + C_L L$$

10.75 INVALID-ORDER-75 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(L_5 s + \frac{1}{C_5 s}\right)}{L_5 s + R_5 + \frac{1}{C_5 s}},\ \frac{1}{C_L s}\right)$

$$H(s) = \frac{C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R_5 s^2 - C_5 L_5 r_o s^2 - C_5 R_5 r_o s + R_5 g_m r_o + R_5 - r_o}{C_5 C_L L_5 R_5 g_m r_o s^3 + C_5 C_L L_5 R_5 s^3 + C_5 C_L L_5 r_o s^3 + C_5 C_L R_5 r_o s^2 + 2C_5 L_5 g_m r_o s^2 + 4C_5 L_5 s^2 + 2C_5 R_5 g_m r_o s + 4C_5 R_5 s + C_L R_5 g_m r_o s + C_L R_5 s + C_L r_o s + 2 g_m r_o + 4}$$

10.76 INVALID-ORDER-76 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(L_5 s + \frac{1}{C_5 s}\right)}{L_5 s + R_5 + \frac{1}{C_5 s}},\ \frac{R_L}{C_L R_L s + 1}\right)$

$$H(s) = \frac{R_L \left(C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R_5 s^2 - C_5 L_5 r_o s^2 - C_5 R_5 r_o s + R_5 g_m r_o + R_5 - r_o\right)}{C_5 C_L L_5 R_5 R_L g_m r_o s^3 + C_5 C_L L_5 R_5 R_L s^3 + C_5 C_L L_5 R_L r_o s^3 + C_5 C_L R_5 R_L r_o s^2 + C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R_5 s^2 + 2C_5 L_5 R_L g_m r_o s^2 + 4C_5 L_5 R_L s^2 + C_5 L_5 r_o s^2 + 2C_5 R_5 R_L g_m r_o s + 4C_5 R_5 R_L s + C_5 R_5 r_o s + C_L R_5 R_L g_m r_o s + C_L R_5 R_L s + C_L R_L r_o s + R_5 g_m r$$

10.77 INVALID-ORDER-77 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(L_5 s + \frac{1}{C_5 s}\right)}{L_5 s + R_5 + \frac{1}{C_5 s}},\ R_L + \frac{1}{C_L s}\right)$

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

10.78 INVALID-ORDER-78 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(L_5 s + \frac{1}{C_5 s}\right)}{L_5 s + R_5 + \frac{1}{C_5 s}},\ L_L s + \frac{1}{C_L s}\right)$

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

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

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

10.80 INVALID-ORDER-80 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(L_5 s+\frac{1}{C_5 s}\right)}{L_5 s+R_5+\frac{1}{C_5 s}},\ L_L s + R_L + \frac{1}{C_L s}\right)$

$$H(s) = \frac{\left(C_L L_L s^2 + C_L R_L s + 1\right)\left(C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R_5 s^2 - C_5 L_5 r_o s^2 - C_5 R_5 r_o s + R_5 g_m r_o + R_5 - r_o\right)}{2C_5 C_L L_5 L_L g_m r_o s^4 + 4C_5 C_L L_5 L_L s^4 + C_5 C_L L_5 R_5 g_m r_o s^3 + C_5 C_L L_5 R_5 s^3 + 2C_5 C_L L_5 R_L g_m r_o s^3 + 4C_5 C_L L_5 R_L s^3 + C_5 C_L L_5 r_o s^3 + 2C_5 C_L L_L R_5 g_m r_o s^3 + 4C_5 C_L L_L R_5 s^3 + 2C_5 C_L R_5 R_L g_m r_o s^2 + 4C_5 C_L R_5 R_L s^2 + C_5 C_L R_5 r_o s^2 + 2C_5 L_5 g_m r_o s^2 + 4C_5 L_5}$$

10.81 INVALID-ORDER-81 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(L_5 s+\frac{1}{C_5 s}\right)}{L_5 s+R_5+\frac{1}{C_5 s}},\ \frac{1}{C_L s+\frac{1}{R_L}+\frac{1}{L_L s}}\right)$

$$H(s) = \frac{L_L R_L s\left(C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R_5 s^2 - C_5 L_5 r_o s^2 - C_5 R_5 r_o s + R_5 g\right.}{C_5 C_L L_5 L_L R_5 R_L g_m r_o s^4 + C_5 C_L L_5 L_L R_5 R_L s^4 + C_5 C_L L_5 L_L R_L r_o s^4 + C_5 C_L L_L R_5 R_L r_o s^3 + C_5 L_5 L_L R_5 g_m r_o s^3 + C_5 L_5 L_L R_5 s^3 + 2C_5 L_5 L_L R_L g_m r_o s^3 + 4C_5 L_5 L_L R_L s^3 + C_5 L_5 L_L r_o s^3 + C_5 L_5 R_5 R_L g_m r_o s^2 + C_5 L_5 R_5 R_L s^2 + C_5 L_5 R_L r_o s^2 + 2C_5 L_L R_5 R_L g}$$

10.82 INVALID-ORDER-82 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(L_5 s+\frac{1}{C_5 s}\right)}{L_5 s+R_5+\frac{1}{C_5 s}},\ \frac{L_L s}{C_L L_L s^2+1} + R_L\right)$

$$H(s) = \frac{\left(C_L L_L R_L s^2 + L_L s + R_L\right)\left(C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R\right.}{C_5 C_L L_5 L_L R_5 g_m r_o s^4 + C_5 C_L L_5 L_L R_5 s^4 + 2C_5 C_L L_5 L_L R_L g_m r_o s^4 + 4C_5 C_L L_5 L_L R_L s^4 + C_5 C_L L_5 L_L r_o s^4 + 2C_5 C_L L_L R_5 R_L g_m r_o s^3 + 4C_5 C_L L_L R_5 R_L s^3 + C_5 C_L L_L R_5 r_o s^3 + 2C_5 L_5 L_L g_m r_o s^3 + 4C_5 L_5 L_L s^3 + C_5 L_5 R_5 g_m r_o s^2 + C_5 L_5 R_5 s^2 + 2C_5 L_5 R_L g_m r_o}$$

10.83 INVALID-ORDER-83 $Z(s) = \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_5\left(L_5 s+\frac{1}{C_5 s}\right)}{L_5 s+R_5+\frac{1}{C_5 s}},\ \frac{R_L\left(L_L s+\frac{1}{C_L s}\right)}{L_L s+R_L+\frac{1}{C_L s}}\right)$

$$H(s) = \frac{R_L\left(C_L L_L s^2 + 1\right)\left(C_5 L_5 R_5 g_m\right.}{C_5 C_L L_5 L_L R_5 g_m r_o s^4 + C_5 C_L L_5 L_L R_5 s^4 + 2C_5 C_L L_5 L_L R_L g_m r_o s^4 + 4C_5 C_L L_5 L_L R_L s^4 + C_5 C_L L_5 L_L r_o s^4 + C_5 C_L L_5 R_5 R_L g_m r_o s^3 + C_5 C_L L_5 R_5 R_L s^3 + C_5 C_L L_5 R_L r_o s^3 + 2C_5 C_L L_L R_5 R_L g_m r_o s^3 + 4C_5 C_L L_L R_5 R_L s^3 + C_5 C_L L_L R_5 r_o s^3 + C_5 C_L R_5 R_L r_o s^2 -$$