a)

BP $\Rightarrow$ LP

4ª Ordem — 2ª Ordem

$A_p = 0{,}5\,dB$ — $A_p = 0{,}5\,dB$

$\omega_0 = 40\,MHz$

$B = 5\,MHz$

$n = 2$

$A_p = 0{,}5\,dB$

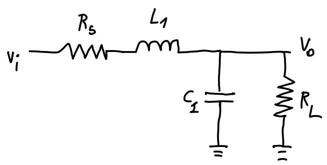
$$T(S) = \frac{K}{D(S)} = \frac{1.431}{S^2 + 1{,}425\,S + 1.516}$$

$$S = \frac{s^2 + \omega_0^2}{Bs}$$

b)

$$T(s) = T(S)\Big|_{S=\frac{s^2+\omega_0^2}{Bs}} = \frac{1.431}{\left(\frac{s^2+\omega_0^2}{Bs}\right)^2 + 1.425\left(\frac{s^2+\omega_0^2}{Bs}\right) + 1.516} = \frac{1.412\times10^{15}\,s^2}{s^4 + 4.477\times10^{7}s^3 + 1.278\times10^{17}s^2 + 2{,}828\times10^{24}s + 3.99\times10^{33}}$$

c)



$$V_o = \frac{R_L /\!/ \frac{1}{SC}}{R_s + SL + R_L /\!/ \frac{1}{SC}}\,V_i \Rightarrow \frac{V_o}{V_i} = \frac{\frac{1}{LC}}{S^2 + \left(\frac{1}{R_L C} + \frac{R_s}{L}\right)S + \frac{R_L + R_s}{R_L C L}} = \frac{1.431}{S^2 + 1{,}425\,S + 1.516}$$

$$\left\{\begin{array}{l} \frac{1}{R_L C} + \frac{R_s}{L} = 1.425 \\ \frac{R_L + R_s}{R_L C L} = 1.516 \\ R_L = 2R_s \end{array}\right. \Rightarrow \left\{\begin{array}{l} R_L = 1 \\ R_s = 0.5 \\ L = 0.9658 \\ C = 1.0245 \end{array}\right.$$

$\Downarrow$ $\times K$

$S = \frac{s^2+\omega_0^2}{Bs}$

d)

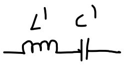
Na realidade:

$R_L = K$ $\rightarrow$ $R_L = 50$

$R_s = \frac{K}{2}$ $\rightarrow$ $R_s = 25$

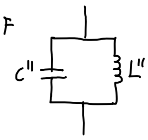
$SL = \frac{s^2+\omega_0^2}{Bs}\cdot 0.9658\cdot K$

$$SL = \frac{s}{B}LK + \frac{\omega_0^2}{Bs}LK \Rightarrow \left|\begin{array}{l} L' = \frac{LK}{B} = 1{,}54\,\mu H \\ C' = \frac{B}{\omega_0^2 LK} = 10.3\,pF \end{array}\right.$$



$SC = \frac{s^2+\omega_0^2}{Bs}\cdot 1.0245\cdot K$

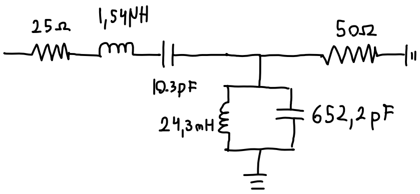
$$SC = \frac{s}{B}C\frac{1}{K} + \frac{\omega_0^2 C}{BK}\cdot\frac{1}{s} \Rightarrow \left|\begin{array}{l} C'' = \frac{C}{BK} = 652{,}2\,pF \\ L'' = \frac{BK}{\omega_0^2 C} = 24{,}3\,mH \end{array}\right.$$



Temos $K = 50$! para $R_L = 50$ e $R_s = 25$

Nota: Temos um offset de ganho DC de

$$\frac{R_L}{R_L + R_s} = \frac{2}{3} \rightarrow -3.5\,dB$$



O filtro não fica nunca adaptado

apenas fica puramente resistivo em $\omega = \omega_0$