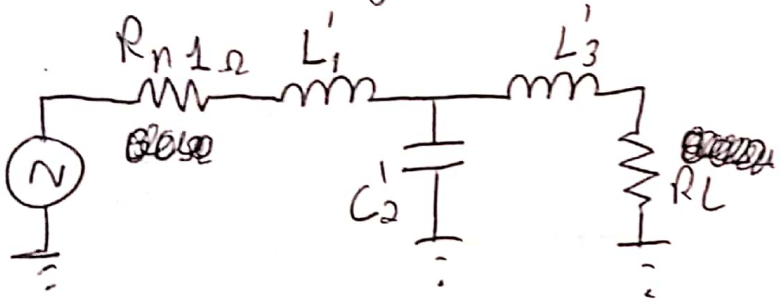
Relatório 11 - Filtros Butterworth

1) $n = 3$
P.A.
$f_c = 1\,MHz$
$R_L = 50\,\Omega$

Número mínimo de indutores: entrada indutiva

Filtro P.B Normalizado:



Da Tabela: $G_1 = 1$, $G_2 = 2$, $G_3 = 1$

$R = R_0 R_n$

$50 = R_0 \cdot 1 \Rightarrow R_0 = 50$

$L'_1 = R_0 \cdot G_1 = 50 \cdot 1 = 50\,H$

$C'_2 = \frac{G_2}{R_0} = \frac{2}{50} = 40\,mF$

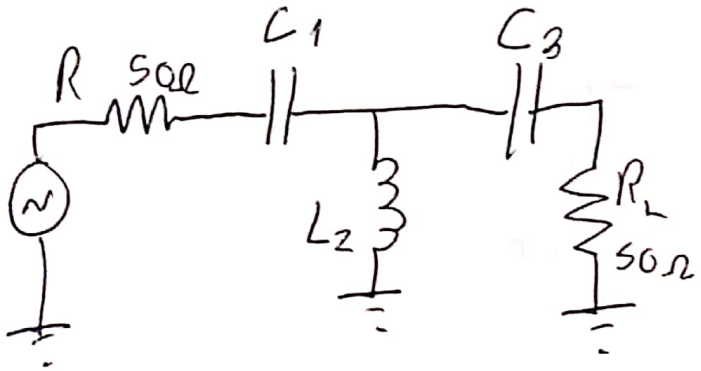
$L'_3 = R_0 \cdot G_3 = 50 \cdot 1 = 50\,H$

$C_1 = \frac{1}{\omega_c \cdot L'_1} = 3,1831\,nF$

$L_2 = \frac{1}{\omega_c C'_2} = 3,9789\,\mu H$

$C_3 = \frac{1}{\omega_c L'_3} = 3,1831\,nF$

Circuito final P.B. → P.A.



2) $n=3$

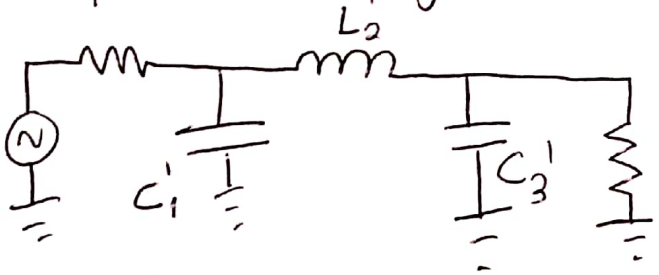
$f_0 = 20\,MHz \Rightarrow \omega_0 \cong 125,664\,M\frac{rad}{s}$

$B_W = 3\,MHz \Rightarrow B_W \cong 18,85\,M\frac{rad}{s}$

$R_L = 50\,\Omega$

P.F. → entrada capacitiva

Filtro P.B. normalizado



Da tabela: $G_1 = 1$, $G_2 = 2$ e $G_3 = 1$

$R = R_0 R_n \Rightarrow R_0 = 50$

$C'_1 = \frac{G_1}{R_0} = \frac{1}{50} = 20\,mF$

$L'_2 = R_0 G_2 = 100\,H$

$C'_3 = \frac{G_3}{R_0} = 20\,mF$

$C_{P1} = \frac{C'_1}{B_W} = 1,061\,nF$

$L_{P1} = \frac{B_W}{\omega_0^2 C'_1} = 59,68\,nH$

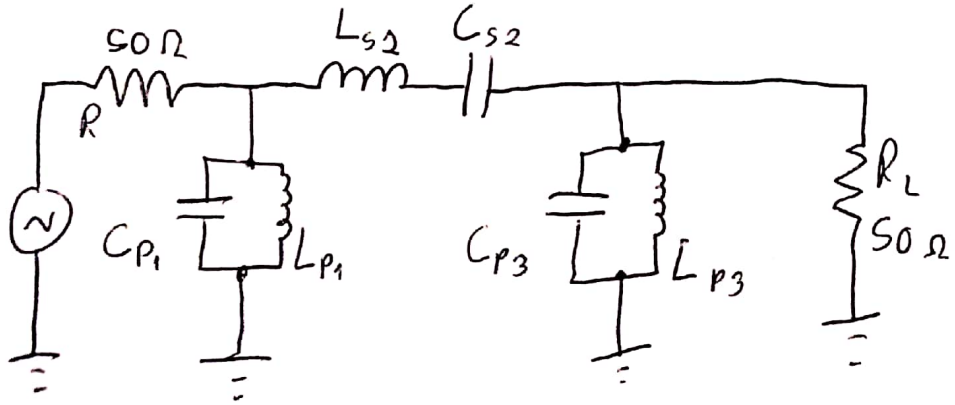
$L_{S2} = \frac{L'_2}{B_W} = 5,305\,\mu H$

$C_{S2} = \frac{B_W}{\omega_0^2 \cdot L'_2} = 11,94\,pF$

$C_{P3} = \frac{C'_3}{B_W} = 1,061\,nF$

$L_{P3} = \frac{B_W}{\omega_0^2 C'_3} = 59,68\,nH$

Circuito final P.B. → P.F.



c) $n = 3$

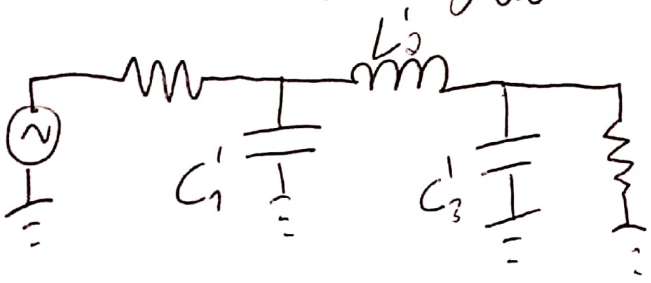
$f_0 = 3\,MHz \Rightarrow \omega_0 \cong 18{,}85\,M \frac{rad}{s}$

$B_w = 2\,MHz \Rightarrow B_w \cong 12{,}566\,M \frac{rad}{s}$

$R_L = 50\,\Omega$

R.F. → entrada capacitiva

Filtro P.B normalizado



Da tabela: $G_1 = 1, G_2 = 2, G_3 = 1$

$R = R_0 R_n \Rightarrow R_0 = 50$

$C_1' = G_1/R_0 = 20\,mF$

$L_2' = R_0 \cdot G_2 = 100\,H$

$C_3' = \frac{G_3}{R_0} = 20\,mF$

$C_{S1} = \frac{B_w \cdot C_1'}{\omega_0^2} = 707{,}3\,pF$

$L_{S1} = \frac{1}{B_w \cdot C_1'} = 3{,}98\,\mu H$

$L_{P2} = \frac{B_w L_2'}{\omega_0^2} = 3{,}54\,\mu H$

$C_{P2} = \frac{1}{B_w L_2'} = 795{,}8\,pF$

$C_{S3} = \frac{B_w \cdot C_3'}{\omega_0^2} = 707{,}3\,pF$

$L_{S3} = \frac{1}{B_w \cdot C_3'} = 3{,}98\,\mu H$

Circuito final: P.B. → R.F.