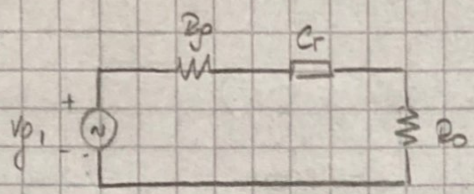
10/12/2020

1) $R_0 = 1$ $\quad C = 1$



a) Para una Z serie, $S_{11} = \frac{Z}{Z+2R_0}$

$$Z S_{11} + 2R_0 S_{11} = Z \longrightarrow Z(1-S_{11}) = 2R_0 S_{11} \longrightarrow Z = \frac{2R_0 S_{11}}{1-S_{11}}$$

De la expresión $S_{11} = \frac{10s+100}{2s^2+232s+120}$ del punto b,

$$Z = 2R_0 \frac{P_{S_{11}}}{\cancel{Q_{S_{11}}}} \cdot \frac{\cancel{Q_{S_{11}}}}{Q_{S_{11}} - P_{S_{11}}} = 2R_0 \frac{10s+100}{2s^2+232s+120-10s-100} =$$

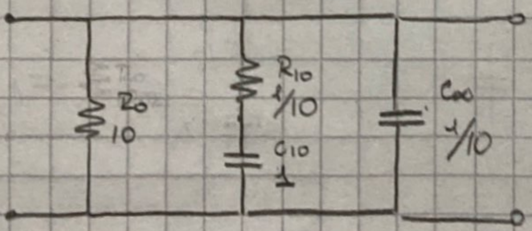
$$Z = 2R_0 \frac{10s+100}{2s^2+222s+20} = R_0 \frac{10s+100}{s^2+111s+10}$$

b) Admitancias en paralelo: Foster // $\quad Y = \frac{s^2+111s+10}{10(s+10)}$

$$Res_{10} = \lim_{s \to -10} \frac{\cancel{(s+10)}}{s} \frac{s^2+111s+10}{10\cancel{(s+10)}} = 10 \longrightarrow R = \frac{1}{10} \quad C = 1$$

$$Res_0 = \lim_{s \to 0} \frac{s^2+111s+10}{10(s+10)} = \frac{1}{10} \longrightarrow R = 10$$

$$Res_\infty = \lim_{s \to 0} \frac{s^2+111s+10}{10(s+10)} \cdot \frac{1}{s} = \frac{1}{10} \longrightarrow C = \frac{1}{10}$$



c) $\lim_{s \to \infty} Z(s) = \lim_{s \to \infty} \frac{10s+100}{s^2+111s+10} = 0$

$\lim_{s \to 0} Z(s) = \lim_{s \to 0} \frac{10s+100}{s^2+111s+10} = 10$

NOTA

$-\frac{Y}{\ldots} = S_{11} \Rightarrow -Y = S_{11}(Y+2Y_0) \Rightarrow (S_{11}+1)Y = -2Y_0 S_{11}$

2) Hasta 4GHz $\qquad T_{T1} = \begin{pmatrix} 0 & -100 \\ 0 & 0 \end{pmatrix}$ $\qquad$ A: LC $\qquad R_L = R_g$

a) $T = \begin{cases} V_1 = A\,V_2 + B\,I_2 \\ I_1 = C\,V_2 + D\,I_2 \end{cases}$ $\qquad B = \left.\dfrac{V_1}{I_2}\right|_{V_2=0} = -100$ $\qquad I_d = -I_2$

$I_{g\,MOS} = 0\,A \therefore V_1 = \dfrac{V_{g1}}{2}$ (Div res de R_g y R_g)

$\left.\dfrac{V_1}{I_2}\right|_{V_2=0} = \left.\dfrac{V_{g1}}{2(-I_d)}\right|_{V_2=0} = -100 \longrightarrow \left.\dfrac{V_{g1}}{I_d}\right|_{V_2=0} = 200$ $\qquad$ Termina acá?

b) $\dfrac{V_o}{V_g}$ Pasabajos max planicidad $\qquad f_c = 2{,}4\,GHz$ $\qquad$ cero en 5GHz

El cuadripolo A tiene $T(s) = \dfrac{V_o}{I_d} \approx \dfrac{V_{2A}}{I_{1A}}$

$\begin{cases} V_1 = Z_{11}\,I_1 + Z_{12}\,I_2 \\ V_2 = Z_{21}\,I_1 + Z_{22}\,I_2 \end{cases}$ $\qquad I_2 = -V_o/R_L$

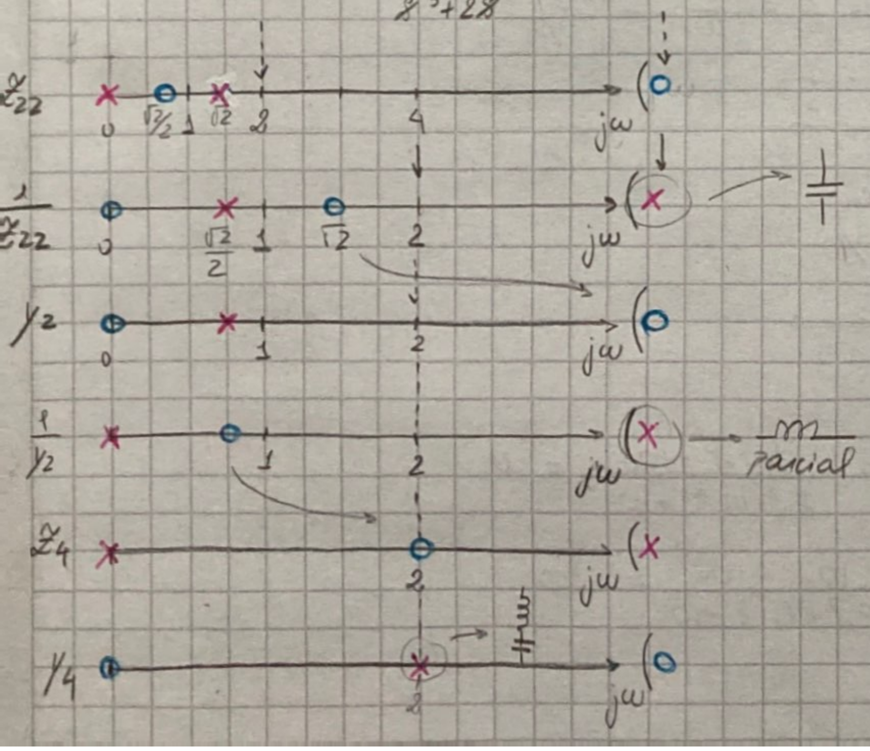
$V_2 = Z_{21}\,I_1 + Z_{22}(-V_2/R_L)$ $\qquad V_2\,(1 + Z_{22}/R_L) = Z_{21}\,I_1$ $\qquad \Omega_Z = R_L$, $\Omega_\omega = 2{,}5\,GHz$

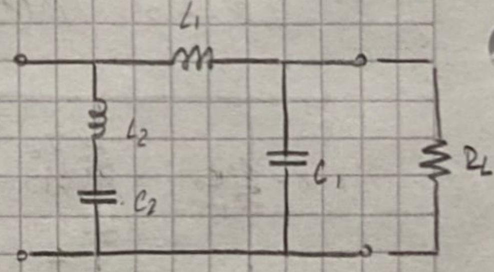
$\left.\dfrac{V_2}{I_1}\right|_{I_2 = \frac{V_2}{R_L}} = \dfrac{Z_{21}}{1 + Z_{22}}$

Como la consigna no indica lo contrario, asumo butter y como es un pasabajos necesito que para $s \to \infty$, sea cero (orden Q > P)

$\dfrac{V_g}{I_d} = \dfrac{k\,(s^2 + 2^2)}{s^3 + 2s^2 + 2s + 1}$

$\dfrac{V_g}{I_d} = k\,\dfrac{\dfrac{s^2 + 2^2}{s^3 + 2s}}{1 + \dfrac{2s^2 + 1}{s^3 + 2s}}$ $\qquad Z_{21} = \dfrac{s^2 + 4}{s(s^2 + 2)}$ $\qquad Z_{22} = \dfrac{2\,(s^2 + 1/2)}{s\,(s^2 + 2)}$





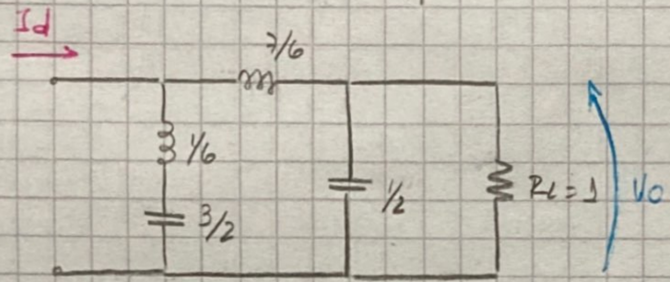
$Y_2 = \frac{1}{Z_{22}} - K_\infty s$ $\qquad \lim_{s \to \infty} \frac{1}{s} \cdot \frac{s(s^2+2)}{2(s^2+1/2)} = \frac{1}{2} = C_1$

$Y_2 = \frac{s^3+2s-s^3-s/2}{2(s^2+1/2)} = \frac{3/2\, s}{2(s^2+1/2)}$

$Z_4 = \frac{1}{Y_2} - K_\infty s \longrightarrow Z_4\big|_{s=j2} = 0$ $\qquad \lim_{s \to j2} \frac{1}{s}\,\frac{4}{3}\,\frac{s^2+1/2}{s} = \frac{7}{6} = L$

$Z_4 = \frac{4}{3}\left(\frac{s^2+1/2 - 7/8\, s^2}{s}\right) = \frac{4}{3}\,\frac{1/8\, s^2+1/2}{s} = \frac{4}{3} \cdot \frac{1}{8}\,\frac{s^2+4}{s} = \frac{1}{6}\,\frac{s^2+4}{s}$

$Y_4 = 6\,\frac{s}{s^2+4}$ → $L = \frac{1}{6}$; $C = 6 \cdot \frac{1}{4} = \frac{3}{2}$

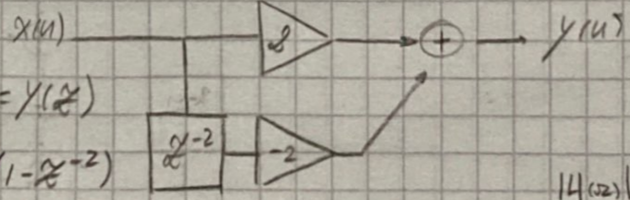


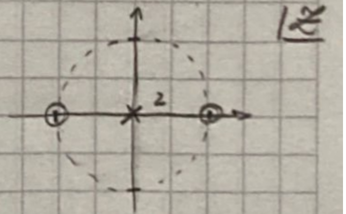
c) $C_1^\circ = \frac{1}{2} \cdot \frac{1}{50\Omega \cdot 2{,}5GHz \cdot 2\pi} = 0{,}64\, pF$ $\qquad R_L = 50\Omega$

$L_1^\circ = \frac{7}{6} \cdot \frac{50}{2\pi\, 2{,}5GHz} = 3{,}71\, nHy$

$L_2^\circ = \frac{1}{6} \cdot \frac{50}{2\pi\, 2{,}5GHz} = 530{,}5\, pHy$ $\qquad C_2^\circ = \frac{3}{2} \cdot \frac{1}{50 \cdot 2\pi\, 2{,}5GHz} = 1{,}91\, pF$

4)



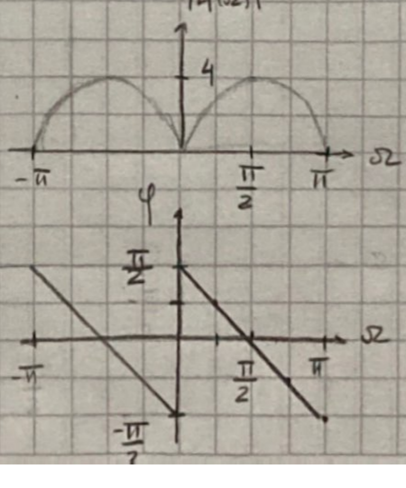


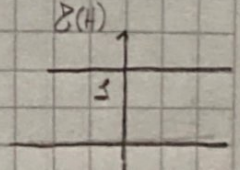
$X(z)(2-2z^{-2}) = Y(z)$

$\frac{Y(z)}{X(z)} = H(z) = 2(1-z^{-2})$

$H(z) = \frac{2(z^2-1)}{z^2}$

$H(\Omega) = 2(1-e^{-2j\Omega})$





b) Es un pasabanda no recursivo (FIR)