Universidad Tecnológica Nacional

Facultad Regional Buenos Aires

Departamento De Electrónica

Teoría de los circuitos II

Año: 2021 **Curso: R4052**

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Trabajo Práctico Nro 8

GRUPO N°: 3

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OBSERVACIONES:

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Aprobado:
Firmado:

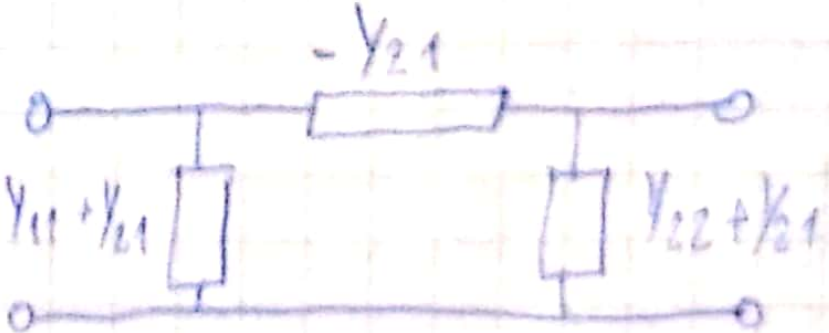
IP8

1) Atenuador tipo PI de 20dB con $Z_0 = 50\,\Omega$

$20\,dB \rightarrow \gamma = \alpha = 2,303$ nepers

$$T = \begin{pmatrix} \cosh\gamma & \operatorname{senh}\gamma Z_0 \\ \frac{\operatorname{senh}\gamma}{Z_0} & \cosh\gamma \end{pmatrix} = \begin{pmatrix} 5,052 & 247,6 \\ 0,1 & 5,052 \end{pmatrix}$$

$$\begin{cases} V_1 = A V_2 + B(-I_2) \\ I_1 = C V_2 + D(-I_2) \end{cases}$$

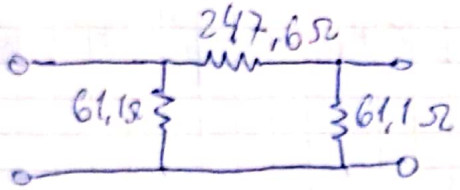


$$Y_{21} = \frac{I_2}{V_1}\Big|_{V_2=0} = \frac{-1}{B} = 4{,}039\ \text{mS}$$

$$Y_{12} = \frac{I_1}{V_2}\Big|_{V_1=0} = -\frac{AD-BC}{B} = \frac{-1}{B}$$

$$Y_{11} = \frac{D}{B} = 0{,}02 \rightarrow Y_{11}+Y_{12} = 0{,}0164\ \text{S}$$

$$Y_{22} = \frac{A}{B} = 0{,}02 \rightarrow Y_{22}+Y_{12} = 0{,}0164\ \text{S}$$



2) Acoplador de banda ancha de 75Ω a 50Ω

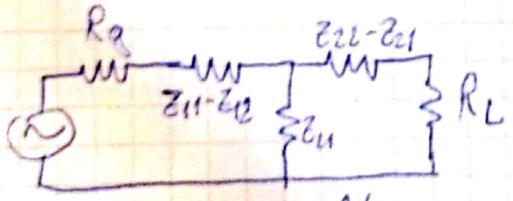
Z_{ref1} Z_{ref2}

$$2_{port\,dB} = 10\log\left(\frac{V_1^2/75\Omega}{V_2^2/50\Omega}\right)$$

$$2_{port\,dB} = 20\log\left(\frac{V_1}{V_2}\right) + \underbrace{10\log\left(\frac{50\Omega}{75\Omega}\right)}_{-1{,}761} =$$

$\beta = 0{,}6585$

$A > D \rightarrow \theta = 1$



$$T = \begin{pmatrix} \cosh\beta\,\frac{\sqrt{6}}{2} & \tanh\beta\,61{,}237 \\ \tanh\beta\,0{,}063 & \frac{\sqrt{6}}{3}\cosh\beta \end{pmatrix}$$

$$T = \begin{pmatrix} 1{,}5 & 43{,}103 \\ 0{,}012 & 1 \end{pmatrix}$$

$(*) = 1/C$

$$Z = \begin{pmatrix} \frac{A}{C} & \frac{AB-BC}{C} \\ \frac{1}{C} & D/C \end{pmatrix}$$

límite realizabilidad

$A \geq 1$

$D \geq 1$

$$\begin{cases} Z_{21} = 86{,}6\,\Omega \\ Z_{11}-Z_{12} = 41{,}66 \\ Z_{22}-Z_{21} = 0 \end{cases}$$

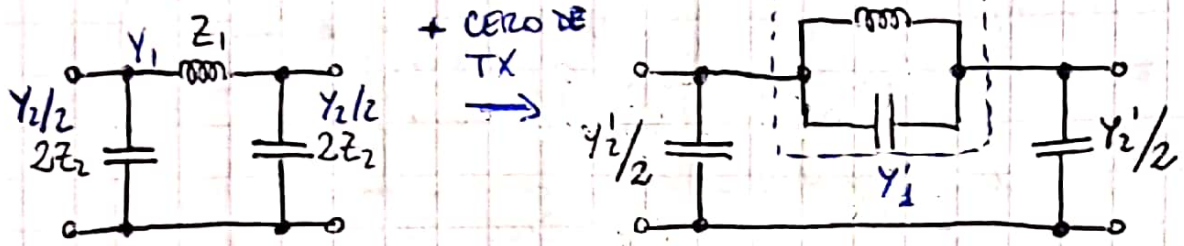
4) FILTRO PASA-BAJOS π

$R = 50\Omega$

IMPEDANCIA $\to \infty$ @ $f = 1\,GHz$

$\alpha_{FILTRO} \to \infty$ @ $f = 1{,}1\,GHz$

- $\omega_c = 2\pi \cdot 10^9$ rad/seg
- CERO DE TRANSMISIÓN @ $\omega_\infty = 2\pi \cdot 1{,}1 \cdot 10^9$ rad/seg
- IMPEDANCIA $\to \infty$ ↳ ADMITANCIA $\to 0$



+ CERO DE TX $\Rightarrow$

$Y_1 = \frac{1}{j\omega L}$

$Y_2 = j\omega C$

$Y'_2 = m \cdot Y_2 = j\omega m C$

$Y'_1 = \frac{1}{j\omega m L} + j\omega C\left(\frac{1-m^2}{4m}\right)$

$\omega_c = 2\pi \cdot 10^9 = \frac{2}{\sqrt{LC}}$

$R = \sqrt{\frac{L}{C}} = 50\Omega$

↳ $\omega_\infty = \frac{\omega_c}{\sqrt{1-m^2}} = 2\pi \cdot 1{,}1 \cdot 10^9$

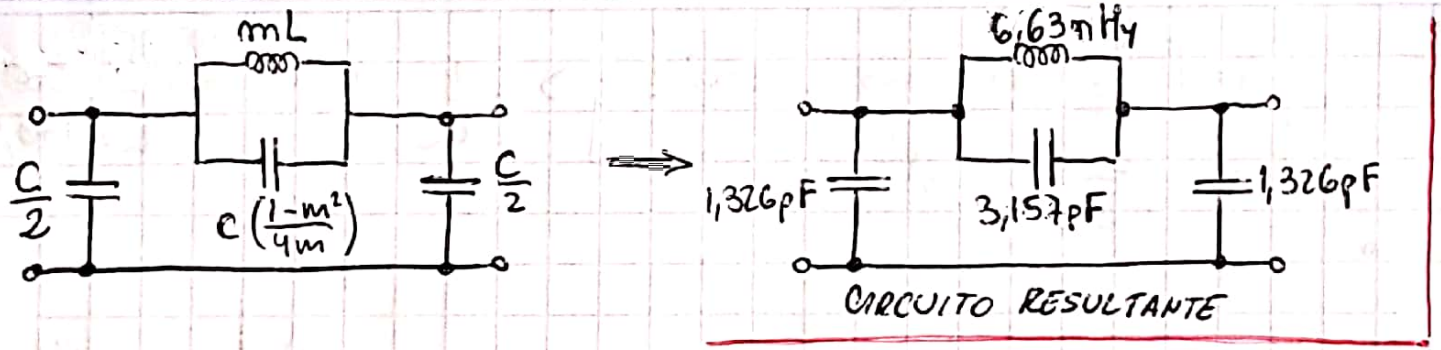
$\frac{\omega_\infty}{\omega_c} = 1{,}1 = \frac{1}{\sqrt{1-m^2}}$

↳ $m = 0{,}417 = \frac{\sqrt{21}}{11}$

↳ $C = 6{,}366\,pF$

$L = 15{,}915\,nHy$

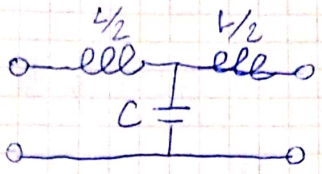
NOTA



CIRCUITO RESULTANTE

5) $f_c = 20K$

$R_L = 600\,\Omega$



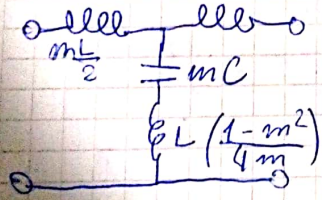
$f_1 \to \infty \begin{cases} \omega_1 = 22K \\ \omega_2 = 10K \\ \omega_3 = \infty \end{cases}$

$1 + \frac{Z_1}{4Z_2} = 0$

$\omega^2 \frac{LC}{4} = -1$

$\omega_0 = \frac{2}{\sqrt{LC}}$ $\quad L = C = 2$

m - derivada 22K



$\omega_c^2 = 1,1^2 = \frac{1}{\frac{1-m^2}{4m}}$

$m = 0,417$

$C' = 0,833$

$L_1' = 0,834$

$L_2' = 0,991$

m - derivada 40K

$4 = \omega_c^2 = \frac{1}{1-m^2} \Rightarrow m = 0,866 = \frac{\sqrt{3}}{2}$

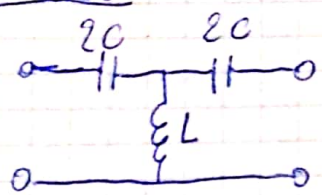
$C' = 1,732$

$L_1' = 0,866 \cdot 2$

$L_2' = \frac{\sqrt{3}}{3} = 0,144$

8) $f_c = 10GHz$ HPF $f_z = 9,5GHz \Rightarrow f_{zn}^2 = 0,95$

K-cte

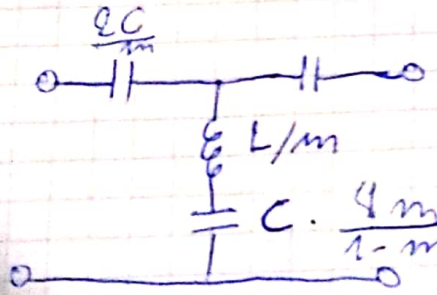


$1 + \frac{Z_1}{4Z_2} = 0$ $\quad Z_1 = \frac{1}{sC}$ $\quad Z_2 = sL$

$\frac{1}{4s^2CL} = -1$

$\omega_c = \frac{1}{2\sqrt{LC}}$ $\quad [C = L = 1/2]$

m-derivada



$0,95^2 = \frac{1}{\frac{L}{m} \cdot \frac{4m}{1-m^2}}$

$0,95^2 = 1 - m^2$

$m = 0,224 < \frac{\sqrt{5}}{10}$

$\frac{C}{m} = \sqrt{5} = 2,236$

$\frac{L}{m} = 2,236$

$C \cdot \frac{4m}{1-m^2} = 0,471$