Circuito RF - EEL7319 Gustavo Simas

RF Design Vol. 3 (Michael Steer)

5.16 1) R_{in} deve ser 5Ω (para máxima transferência de potência)

Logo: $R_{IN} = V_2/I_2 = \left(\frac{m}{n}\right)^2 \cdot 2 \cdot R_0$

$\Rightarrow 5 = \left(\frac{m}{n}\right)^2 \cdot 2 \cdot 75 \Rightarrow \frac{m}{n} = 0,1825$

2) $Q = \omega_r \cdot L / R$

$= 2\pi \cdot 10^9 \cdot 10 \cdot 10^{-9} / 5$

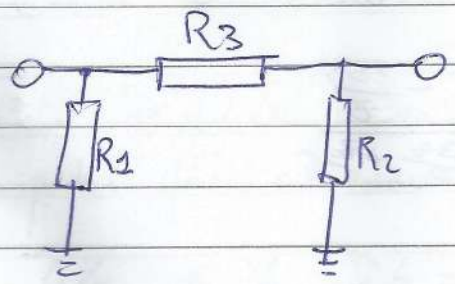
$= 12,56$

$L = 10\,nH$

$R = 5\,\Omega$

$f = 1\,GHz$

7)



$R_1 = R_2$

$Z_0 = \sqrt{(R_1^2 \cdot R_3)/(2R_1 + R_3)}$

$K = \sqrt{(R_1 + Z_0)/(R_1 - Z_0)}$

d)

$$\Rightarrow R_1 = \frac{z_{01}\cdot(K-1)\cdot\sqrt{z_{02}}}{(K+1)\cdot\sqrt{z_{02}} - 2\cdot\sqrt{K\cdot z_{01}}}$$

$$\Rightarrow R_2 = \frac{z_{02}\cdot(K-1)\cdot\sqrt{z_{01}}}{(K+1)\sqrt{z_{01}} - 2\cdot\sqrt{K\cdot z_{02}}}$$

$$\Rightarrow R_3 = \frac{(K-1)}{2}\cdot\sqrt{\frac{z_{01}\cdot z_{02}}{K}}$$

Como $z_{01} = z_{02} = z_0$

Então:

$$R_1 = R_2 = z_0\cdot\left(\frac{\sqrt{K}+1}{\sqrt{K}-1}\right)$$

e

$$R_3 = \frac{z_0\cdot(K-1)}{2\sqrt{K}}$$

Se $R_1 = R_2$ então:

$$\Rightarrow z_0 = \sqrt{\frac{R_1^2\cdot R_3}{2\cdot R_1 + R_3}} \quad \text{e} \quad K = \left(\frac{R_1 + z_0}{R_1 - z_0}\right)^2$$

8) Resistive Pi Attenuator — Π-network

$K_{dB} = 10 \log(K)$

$K_{dB} = 10\,dB$ $\Rightarrow K = 10^{20/20} = 10$

$Z_0 = 100\,\Omega$

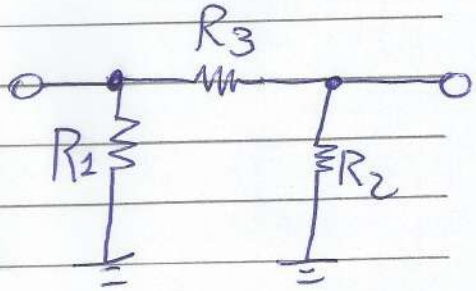
$\Rightarrow R_1 = R_2 = Z_0 \cdot \left(\frac{\sqrt{K}+1}{\sqrt{K}-1}\right)$

$= 100 \cdot (\sqrt{10}+1)/(\sqrt{10}-1)$

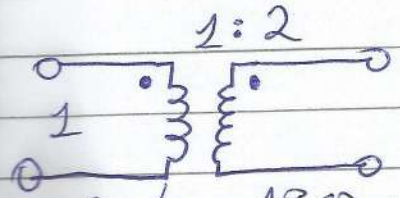
$= 192{,}5\,\Omega$

$\Rightarrow Z_0 = \sqrt{\frac{R_1^2 \cdot R_3}{2R_1 + R_3}}$

$\Rightarrow R_3 = \frac{Z_0^2 \cdot 2R_1}{(R_1^2 - Z_0^2)} = 142{,}30\,\Omega$



11)



$Z_0 = 50\,\Omega$

Pelos parâmetros ABCD tabelados:

$\Rightarrow A = n = 0{,}5$ $\Rightarrow B = 0$

$\Rightarrow C = 0$ $\Rightarrow D = 1/n = 2$

$\Rightarrow \Delta = A + B/Z_0 + C \cdot Z_0 + D = 2{,}5$

$\Rightarrow S_{21} = \frac{2}{\Delta} = \frac{2}{2{,}5} = 0{,}8 = S_{12}$

$\Rightarrow S_{22} = \frac{-A + B/Z_0 - C \cdot Z_0 + D}{\Delta}$

$= 1{,}5/2{,}5 = 0{,}6$

$\Rightarrow S_{11} = \frac{A + B/Z_0 - C \cdot Z_0 - D}{\Delta}$

$= -1{,}5/2{,}5 = -0{,}6$

$\Rightarrow S_{12} = \frac{2 \cdot (AD - BC)}{\Delta}$

$= \frac{2}{2{,}5} = 0{,}8$

$$S = \begin{bmatrix} -0{,}6 & 0{,}8 \\ 0{,}8 & 0{,}6 \end{bmatrix}$$