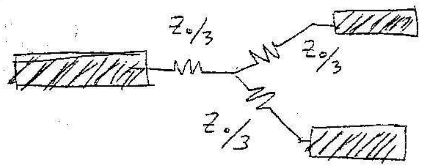
Wilkinson Power Divider

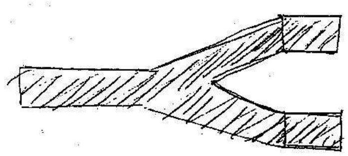


Divisor resistivo,
- Tiene pérdidas

$$[S] = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} \frac{1}{2}$$

$$\downarrow$$

$$|1/2|^2 + |1/2|^2 \neq 1$$

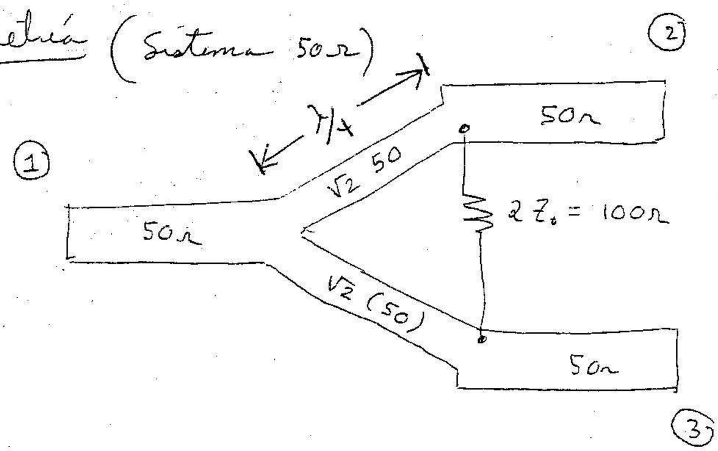


"Tee junction"
- no está acoplado
- no hay aislación

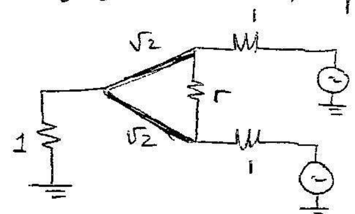
El "Wilkinson Power Divider"

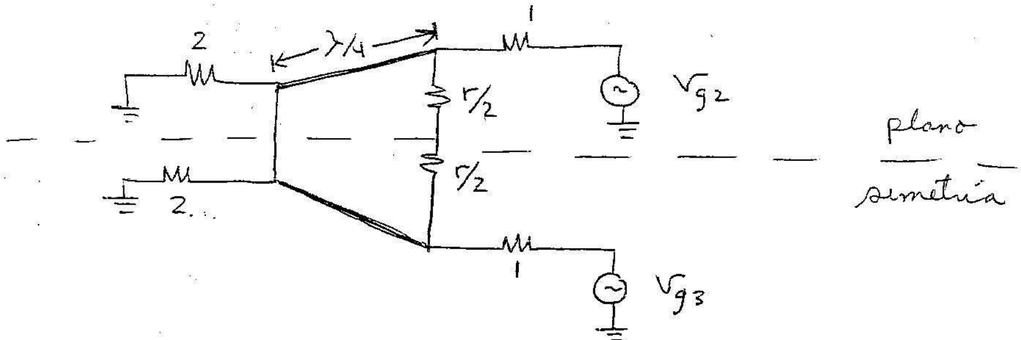
- Está acoplado
- aislación entre puertos de salida
- Es "lossy" solamente bajo ciertas circunstancias

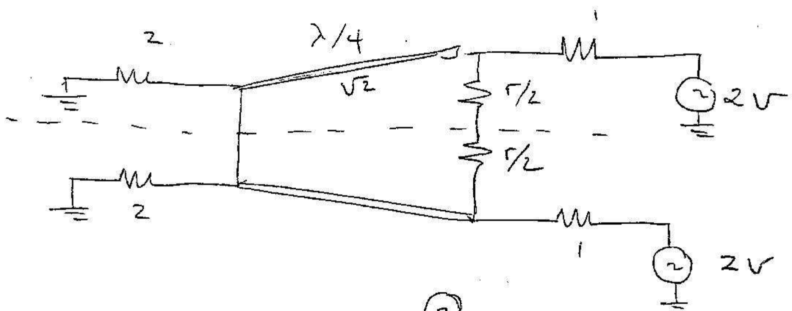
Geometría (Sistema 50Ω)



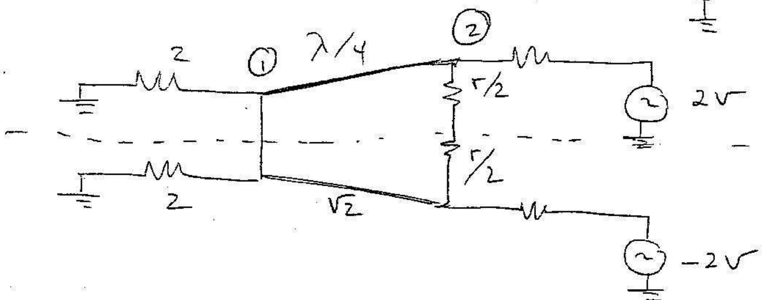
Analisis Modo Par e impar (normalizando)





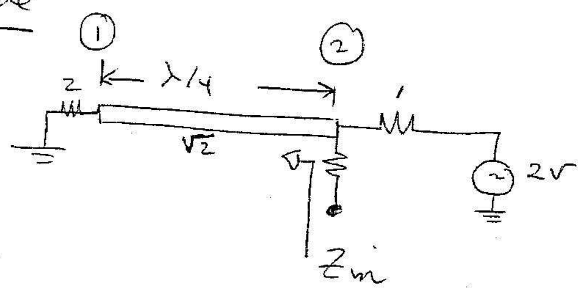


Even

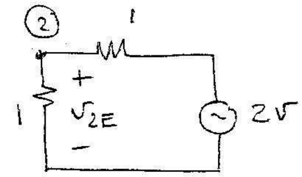


Odd

Even mode

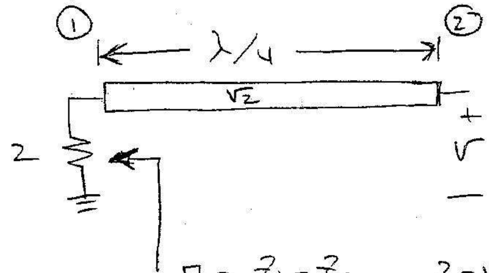


$$Z_{in} = \frac{Z_0^2}{Z_L} = \frac{(\sqrt{2})^2}{2} = \underline{1}$$



$$\boxed{V_{2E} = V}$$

$$\boxed{\Gamma_{2e} = 0}$$



$$\Gamma = \frac{Z_L - Z_0}{Z_L + Z_0} = \frac{2-\sqrt{2}}{2+\sqrt{2}} = .173$$

En la línea de transmisión

$$V_z(z) = V^+\left(e^{-j\beta z} + \Gamma e^{+j\beta z}\right)$$

carga $(z=2)$ la definimos en posición $z = 0$

$$V_{2E} = V_z\left(z = -\frac{\lambda}{4}\right) = V^+\left(e^{j\pi/2} + \Gamma e^{-j\frac{\pi}{2}}\right)$$

$$V = V^+ j\,(1-\Gamma)$$

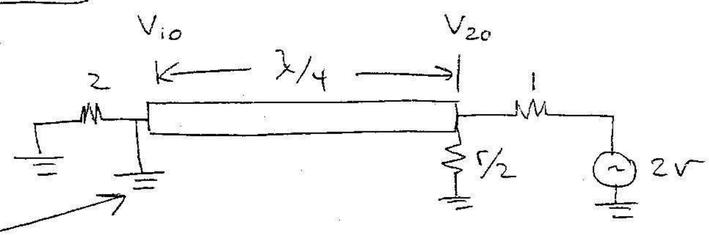
$$V = V^+ j\,(1-.173)$$

$$V^+ = \frac{-jV}{1-\Gamma}$$

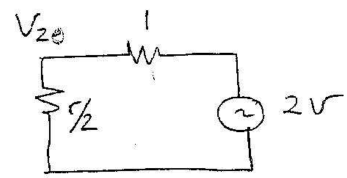
$$V_{1e} = V_z(z=0) = V^+(1+\Gamma) = \frac{-jV}{1-.173}(1+.173) = -j\sqrt{2}\,V$$

$$\boxed{V_{1e} = -j\sqrt{2}\,V}$$

Modo Impar :



$\boxed{V_{1o} = 0}$ $\Longrightarrow$



Match:
Si r = 2

$\boxed{V_{2o} = V}$

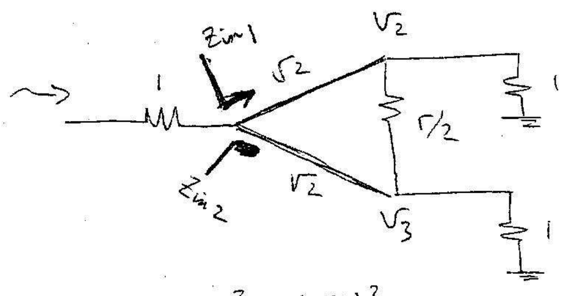
$\boxed{\Gamma_{2o} = 0}$

$S_{23} = S_{32} = 0$ (Señal se encuentra con corto circuito ó circuito abierto)

$S_{22} = S_{33} = 0$ $(\Gamma_{2o} = 0 \; , \; \Gamma_{2e} = 0)$

$$S_{21} = S_{12} = \frac{V_{1o} + V_{1e}}{V_{2o} + V_{2e}} = \frac{0 - j\sqrt{2}V}{V + V} = \frac{-j}{\sqrt{2}} = -j \cdot 707$$

Para calcular S_{11}

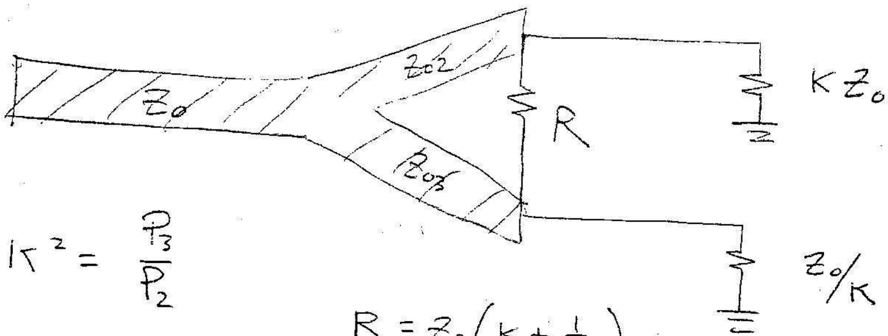


$V_2 = V_3$
∴ asemeja caso del modo par.

$$Z_{in_1} = \frac{Z_o^2}{Z_L} = \frac{(\sqrt{2})^2}{1} = 2$$

$$Z_{in_1} // Z_{in_2} = \underline{1}$$

Si deseo división desigual,



$K^2 = \frac{P_3}{P_2}$

$R = Z_0\left(K + \frac{1}{K}\right)$

$Z_{03} = Z_0\sqrt{\frac{1+K^2}{K^3}}$ $\qquad Z_{02} = Z_0\sqrt{K(1+K^2)}$