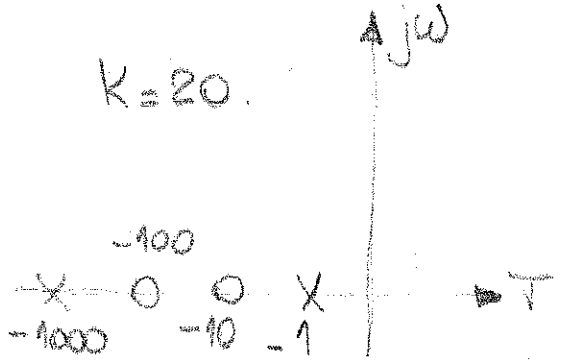
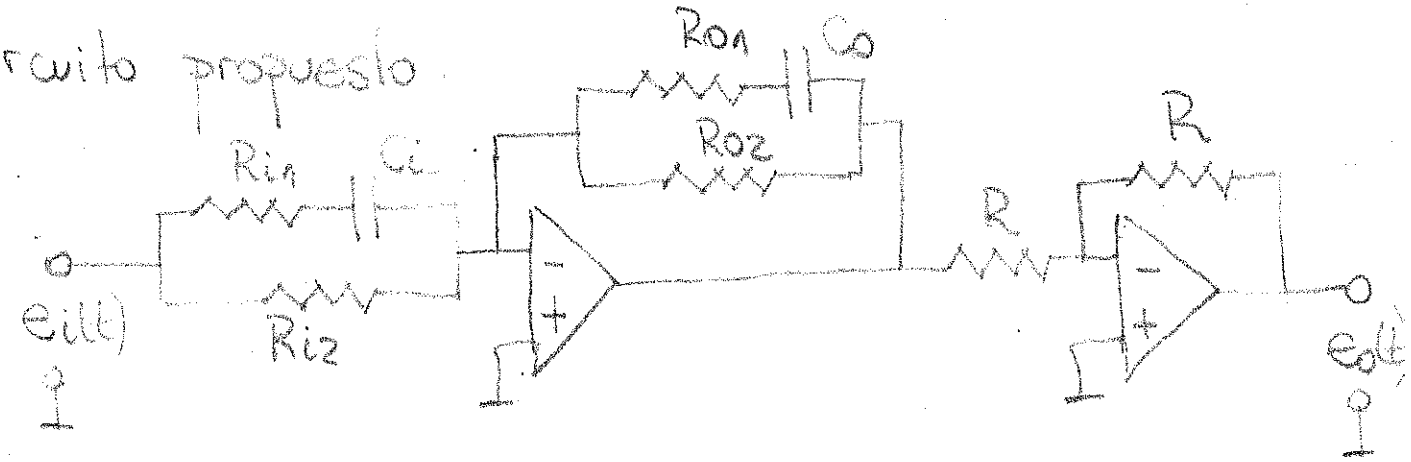
Ej 6): Sintetizar el siguiente diagrama polar:



Circuito propuesto



$$\frac{E_o(s)}{E_i(s)} = -\frac{Z_o(s)}{Z_i(s)} \cdot \left[-\frac{R}{R}\right] = \frac{Z_o(s)}{Z_i(s)}$$

$$Z_o(s) = \frac{1}{\frac{1}{Ro1 + \frac{1}{sCo}} + \frac{1}{Ro2}} = \frac{1}{\frac{sCo}{Ro1\,Co\,s+1} + \frac{1}{Ro2}}$$

$$Z_o(s) = \frac{Ro2\,(Ro1\,Co\,s+1)}{Ro2\,Co\,s + Ro1\,Co\,s + 1} = \frac{Ro2\,Ro1\,Co\left(s+\frac{1}{Ro1\,Co}\right)}{(Ro2+Ro1)\,Co\,s+1}$$

$$Z_o(s) = \frac{\frac{Ro1\,Ro2\,Co}{(Ro1+Ro2)\,Co}\left(s+\frac{1}{Ro1\,Co}\right)}{s+\frac{1}{(Ro1+Ro2)\,Co}}$$

donde

$$Ro1 // Ro2 = \frac{Ro1\,Ro2}{Ro1+Ro2}$$

Dado que las configuraciones de las parejas de $Z_o(s)$ y $Z_i(s)$ son idénticas, tendremos:

$$\frac{E_o(s)}{E_i(s)} = \frac{R_{o1}\|R_{o2}}{R_{i1}\|R_{i2}} \frac{\left(s+\frac{1}{R_{o1}C_o}\right)\left[s+\frac{1}{(R_{i1}+R_{i2})C_i}\right]}{\left[s+\frac{1}{(R_{o1}+R_{o2})C_o}\right]\left(s+\frac{1}{R_{i1}C_i}\right)} = 20\,\frac{(s+10)(s+100)}{(s+1)(s+1000)}$$

$$\frac{R_{o1}\|R_{o2}}{R_{i1}\|R_{i2}} = 20\,; \quad R_{o1}C_o = 0{,}1\,; \quad (R_{i1}+R_{i2})C_i = 0{,}01$$

$$(R_{o1}+R_{o2})C_o = 1 \qquad R_{i1}C_i = 0{,}001$$

La pauta de diseño es que: $1\,k\Omega < \text{resist.} < 1\,M\Omega$

con $\boxed{R_{o1} = 100\,k\Omega}$ $\quad C_o = \frac{0{,}1}{10^5} = \boxed{1\,\mu F = C_o}$

$$R_{o1}+R_{o2} = \frac{1}{C_o} = 10^6\,; \quad R_{o2} = 10^6 - 0{,}1\cdot 10^6 = \boxed{900\,k\Omega = R_{o2}}$$

$$R_{o1}\|R_{o2} = \frac{0{,}1\,M\Omega \cdot 0{,}9\,M\Omega}{0{,}1\,M\Omega + 0{,}9\,M\Omega} = \frac{0{,}09}{1}\,M\Omega = 90\,k\Omega$$

$$R_{i1}\|R_{i2} = \frac{90\,k\Omega}{20} = \boxed{4{,}5\,k\Omega = \frac{R_{i1}\cdot R_{i2}}{R_{i1}+R_{i2}}} \quad *$$

$$\frac{R_{i1}C_i}{(R_{i1}+R_{i2})C_i} = \frac{0{,}001}{0{,}01} = 0{,}1 = \frac{R_{i1}}{R_{i1}+R_{i2}} \quad *$$

$$R_{i2} = \frac{4{,}5\,k\Omega}{0{,}1} = \boxed{45\,k\Omega = R_{i2}}$$

$$4{,}5\,k\Omega = \frac{R_{i1}\cdot 45\,k\Omega}{R_{i1}+45\,k\Omega}\,; \quad 4{,}5R_{i1} + 202{,}5\,k\Omega = 45R_{i1}$$

$$R_{i1} = \frac{202,5\,k\Omega}{45-4,5} = \frac{202,5\,k\Omega}{40,5} = 5\,k\Omega = R_{i1}$$

$$C_i = \frac{0,001}{5\,k\Omega} = 0,2\,\mu F = C_i$$