Note Title 10/17/2017

@ $\omega_0 = 1/2\sqrt{2}$ $\quad y_R(a) = y_i(a)\left[\dfrac{k\,y_i(k) - a\,y_i(a)}{k\,y_i(a) - a\,y_i(k)}\right]$; $\dfrac{a^2 + \frac{1}{4}a + 1/16}{a^2 + \frac{1}{4}a + 1/4} = y_1 \quad = (1/\sqrt{2})\,y_i'$

$(k^2 + 1/8)(k - 1/4) \doteq y_{L}(j\omega_0)$, $\quad y_1(a)$:

$k = 1/4 \quad y_1(k) = 1/2$

$$y_R = \frac{1}{2}\left[\frac{\frac{1}{8} - a\left[\frac{a^2 + \frac{a}{4} + 1/16}{a^2 + a/4 + 1/4}\right]}{\frac{1}{4}\left[\frac{a^2 + a/4 + 1/16}{a^2 + a/4 + 1/4}\right] - \frac{1}{2}a}\right] = \frac{1}{2}\left[\frac{\frac{a^2 + \frac{a}{4} + 1/4}{8} - \left(a^3 + \frac{a^2}{4} + \frac{a}{16}\right)}{\frac{\left(a^2 + \frac{a}{4} + \frac{1}{16}\right)}{4} - \frac{1}{2}\left(a^3 + \frac{a^2}{4} + \cancel{a}/4\right)}\right] = \frac{1}{2}\left[\frac{-a^3 - \frac{a^2}{8} - \frac{a}{32} + \frac{1}{32}}{-\frac{a^3}{2} + \frac{a^2}{8} - \frac{a}{16} + 1/64}\right]$$

$(\cancel{a + k})(a - k) = a - k$ $\qquad$ should cancel

$$
\begin{array}{r|l}
 & -s^2 - \frac{3}{8}s - \frac{4}{32} \\
\hline
s - 1/4 & -s^3 - \frac{s^2}{8} - \frac{s}{32} + 1/32 \\
 & -s^3 + \frac{s^3}{4} \\
\hline
 & -\frac{3s^2}{8} - \\
 & -3/8\, s^2 + \frac{3}{32}s \\
\hline
 & -\frac{4}{32}s + 1/32
\end{array}
$$

$$
\begin{array}{r|l}
 & -s^2/2 - 1/16 \quad = -(s^2 + 1/8)/2 \\
\hline
s - 1/4 & -\frac{s^3}{2} + \frac{s^2}{8} - \frac{s}{16} + 1/64 \\
 & -\frac{s^3}{2} + \frac{s^2}{8} - s/16 + 1/64 \\
\hline
\end{array}
$$

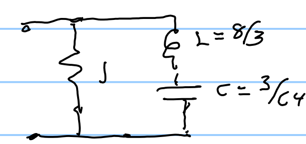
should give a pole of y_a @ $s = j\omega_0$

$$y_a(s) = \frac{1}{2}\frac{(s-1/4)}{(s-1/4)} \frac{\left[-s^2 - \frac{3}{8}s - 4/32\right]}{-(s^2+1/8)/2} = \frac{1}{2}\cdot\left(\frac{s^2 + \frac{3s}{8} + 4/32}{(s^2+1/8)}\right) \times 2 = \frac{2k_1 s}{s^2+1/8} + y_2 = \frac{\frac{3}{8}s}{s^2+1/8} + y_2$$

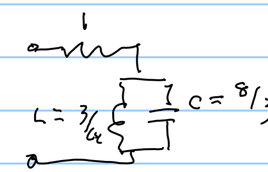
$$\frac{\cancel{s^2+8}}{s}\left[\frac{s^2 + \frac{3}{8}s + 1/8}{\cancel{s^2+8}}\right]\Bigg|_{s^2 = -1/8} = 2k_1 = \frac{\left[-1/8 + \frac{3}{8}s + 1/8\right]}{s} = \frac{3}{8}\frac{s}{s} = 3/8$$

$$s^2 + \frac{3\cancel{s}}{\cancel{8}} + 4/32 = \frac{3}{\cancel{8}}s + (s^2 + 1/8)\, y_{2} \Rightarrow y_2 = 1$$

$$y_R(s) = \frac{\frac{3}{8}s}{s^2+8} + 1$$



$$y_R \Big|_{\text{dsang}} =$$



$$y(s) = y(k)\left[k\,y(k) + s\,y_R(s)\right] \Big/ \left[k\,y_R(s) + s\,y(k)\right] = \frac{k\,y(k) + s\,y_R(s)}{k\,y_R(s)/y(k) + s}$$

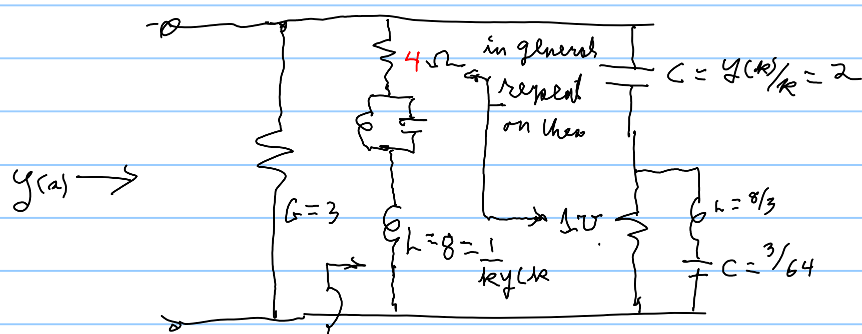
$$y_R(s) = y_i(k)\left[\frac{k\,y_i(k) - s\,y_i(s)}{k\,y_i(s) - s\,y_i(k)}\right]; \Rightarrow \quad (k\,y(s) - s\,y(k))\,y_R = y(k)\left[k\,y(k) - s\,y(s)\right]$$

$$y(s)\left[k\,y_R + \quad s\,y(k)\right] = \left[y(k)\,k\,y(k) + s\,y(s)\,y_R\right]$$

$$y = \frac{k\, y(k)}{\dfrac{k\, y_R(s)}{y(k)} + s} + \frac{s\, y_R(s)}{\dfrac{k\, y_R(s)}{y(k)} + s} = \frac{1}{\underbrace{\dfrac{1}{y(k)^2}\, y_R(s) + \dfrac{s}{k\, y(k)}}_{\text{an impedance } z}} + \frac{1}{\underbrace{\dfrac{k}{s}\cdot\dfrac{1}{y(k)} + \dfrac{1}{y_R(s)}}_{\text{a } y}}$$

$k = 1/4$

$y(k) = 1/2$



no transformers.

$y_1(s)$, minimum PR, $\mathrm{Re}\, y_1(j\omega_0) = 0$, y_R is PR with a pole at $s = j\omega_0$ created by $k > 0$