

$$1) \quad F(s) = \frac{s^4 + 4s^2 + 3}{s(s^2 + 2)}$$

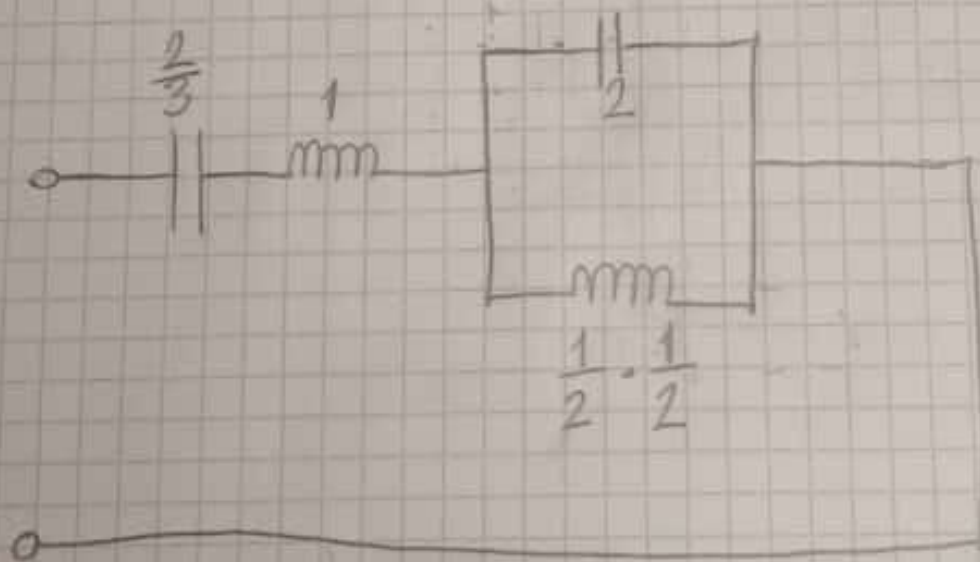
$$a) \quad K_{\phi} = \lim_{s \rightarrow 0} sF(s) = \frac{3}{2}$$

$$K_{\infty} = \lim_{s \rightarrow \infty} \frac{F(s)}{s} = 1$$

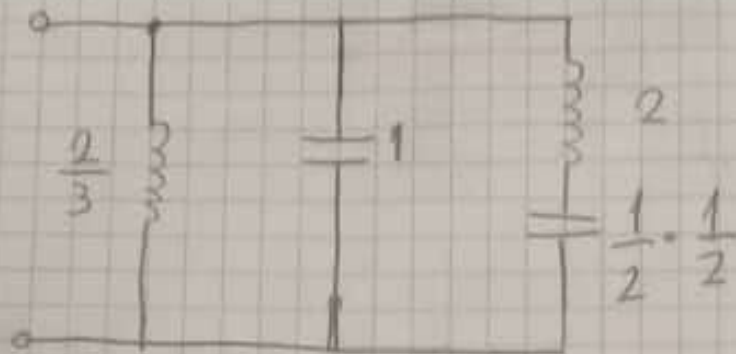
$$2K_1 = \lim_{s^2 \rightarrow -\omega_1^2} F(s) \cdot \frac{(s^2 + \omega_1^2)}{s}$$

$$\omega_1^2 = 2$$

$$2K_1 = \lim_{s^2 \rightarrow -2} \frac{s^4 + 4s^2 + 3}{s^2} = \frac{1}{2}$$



b)



c)

$$F(s) = \frac{s^4 + 4s^2 + 3}{s^3 + 2s}$$

$$\begin{array}{r} s^4 + 4s^2 + 3 \\ s^3 + 2s \end{array} \quad \begin{array}{r} s^3 + 2s \\ \hline 1s \end{array}$$

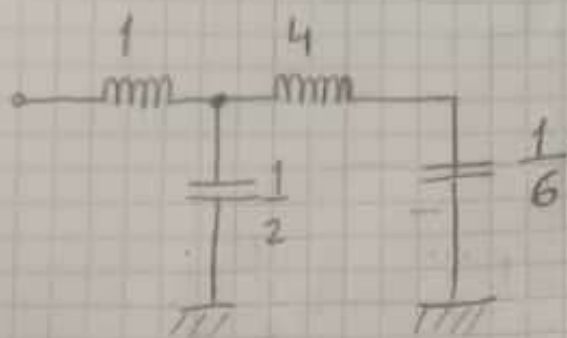
$$\begin{array}{r} s^3 + 2s \\ \hline 2s^2 + 3 \end{array} \quad \begin{array}{r} 2s^2 + 3 \\ \hline 1s \end{array}$$

$$\begin{array}{r} 2s^2 + 3 \\ \hline 2s^2 \end{array} \quad \begin{array}{r} 3 \\ \hline 1s \end{array} \quad \begin{array}{r} 1s \\ \hline 1 \end{array}$$

$$\begin{array}{r} 1s \\ \hline 1s \end{array} \quad \begin{array}{r} 3 \\ \hline 4 \end{array} \quad \begin{array}{r} 4 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 1s \\ \hline 0 \end{array} \quad \begin{array}{r} 1s \\ \hline 6 \end{array}$$

$$\frac{1}{6}$$

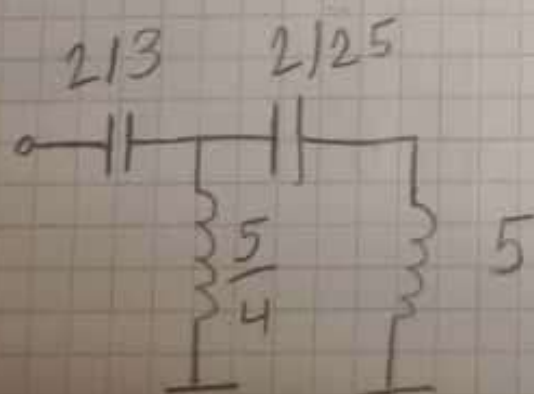


d)

$$\begin{array}{r}
 3 + 4s^2 + s^4 \quad | \quad 2s + s^3 \\
 \underline{\frac{3}{2} + \frac{3}{2}s^2} \quad \quad \quad \frac{3}{2} \frac{1}{s} \\
 2s + s^3 \quad | \quad \frac{5s^2 + s^4}{2} \\
 \underline{2s + \frac{4}{5}s^3} \quad \quad \quad \frac{4}{5} \frac{1}{s} \\
 \frac{5s^2 + s^4}{2} \quad | \quad \frac{1}{5}s^3 \\
 \underline{\frac{5}{2}s^2} \quad \quad \quad \left(\frac{25}{2} \right) \frac{1}{s} \\
 \frac{1}{5}s^3 \quad | \quad s^4 \\
 \underline{\frac{1}{5}s^3} \quad \quad \quad \left(\frac{1}{5} \right) \frac{1}{s} \\
 0
 \end{array}$$

The above polynomial division steps are connected by curved lines to the following circuit components:

- The term $\frac{3}{2} \frac{1}{s}$ is connected to a capacitor labeled $\frac{2}{3}$.
- The term $\left(\frac{25}{2} \right) \frac{1}{s}$ is connected to a capacitor labeled $\frac{5}{4}$.
- The term $\left(\frac{1}{5} \right) \frac{1}{s}$ is connected to a capacitor labeled $\frac{2}{25}$.
- The final term 5 is connected to an inductor labeled 5 .



2)

$$Y(s) = \frac{s^5 + 18s^3 + 48s}{6s^4 + 42s^2 + 48}$$

$$Z(s) = \frac{6s^4 + 42s^2 + 48}{s^5 + 18s^3 + 48s}$$

Remoción de 0

$$48 + 42s^2 + 6s^4 \overline{) 48s + 18s^3 + s^5}$$

$$48 + 18s^2 + s^4 \quad \frac{1}{s}$$

$$C_1 = 1$$

$$48 + 18s^3 + s^5 \overline{) 24s^2 + 5s^4}$$

$$48 + 10s^3 \quad \frac{2}{s}$$

$$8s^3 + s^5$$

$$\frac{1}{2} = L_1$$

$$F(s) = \frac{1}{s} + \frac{24s^2 + 5s^4}{48s + 18s^3 + s^5} = \frac{1}{s} + \frac{1}{\frac{48s + 18s^3 + s^5}{24s^2 + 5s^4}}$$

$$F(s) = \frac{1}{s} + \frac{1}{\frac{2}{s} + \frac{8s^3 + s^5}{24s^2 + 5s^4}} = \frac{1}{s} + \frac{1}{\frac{2}{s} + \frac{1}{\frac{24s^2 + 5s^4}{8s^3 + s^5}}}$$

F3

$$F_3(s) = Z_3(s) = \frac{5s^4 + 24s^2}{s^5 + 8s^3} = \frac{s^2(5s^2 + 24)}{s^3(s^2 + 8)}$$

$$F_3(s) = \frac{5s^2 + 24}{s(s^2 + 8)}$$

$$K_0 = \lim_{s \rightarrow 0} s \cdot F_3 = 24$$

$$K_{\infty} = \lim_{s \rightarrow \infty} \frac{F_3(s)}{s} = 0$$

$$2K_1 = \lim_{s^2 \rightarrow -8} \frac{F_3(s)(s^2 + 8)}{s} = \frac{5s^2 + 24}{s^2} = 2$$

