#1 $Z(s)$? $K_0 = \frac{3}{4}$ $K_\infty = \frac{1}{3}$ $K_1 = \frac{5}{8}$

40J41

$$Z(s) = \frac{3}{4s} + \frac{1}{3}s + \frac{5s}{4(s^2+2)_2} = ~~\frac{\quad}{(s^2+2)24}~~$$

$3 \mid 4 \mid 8 = 24$

$$Z(s) = \frac{18(s^2+2) + 8(s^2+2)s^2 + 5s\,3s}{24(s^2+2)s} = \frac{18s^2+36+8s^4+16s^2+15s^2}{24(s^2+2)s}$$

$$Z(s) = \frac{8s^4+49s^2+36}{24(s^2+2)s}$$

$8s^4 + 49s^2 + 36 \;\big|\; 24s^3 + 48s$

$- \quad 8s^4 + 16s^2 \qquad \frac{1}{3}s$

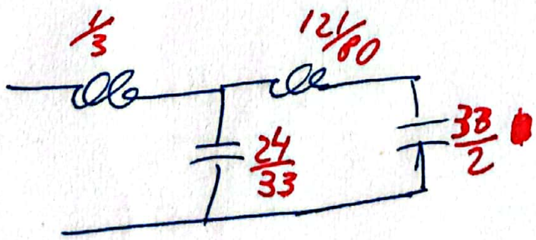
$24s^3 + 48s \;\big|\; 0 + 33s^2 + 36$

$24s^3 + \frac{288}{11}s \qquad \frac{24}{33}s$

$33s^2 + 36 \;\big|\; 0 \quad \frac{240}{11}s$

$\frac{240}{11}s \;\big|\; 36 \qquad s\frac{11}{240} \cdot 33 = \frac{121}{80}s$

$0 \qquad s\frac{11}{240} \cdot 36 = \frac{33}{2}$



#2) $\dfrac{8s^4+49s^2+36}{24s^3+48s}$

$36+49s^2+8s^4 \;\big|\; 48s+24s^3 \qquad \dfrac{3}{4}\dfrac{1}{s}$

$36+18s^2$

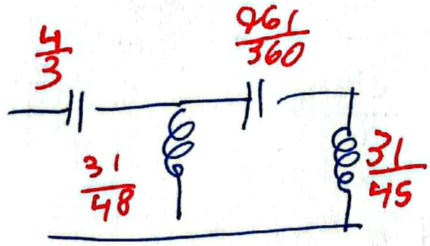
$48s+24s^3 \;\big|\; 31s^2+8s^4 \qquad \dfrac{48}{31}\dfrac{1}{s}$

$48s+\dfrac{384}{31}s^3$

$31s^2+8s^4 \;\big|\; \dfrac{360}{31}s^3 \qquad \dfrac{1}{s}\dfrac{31^2}{360}$

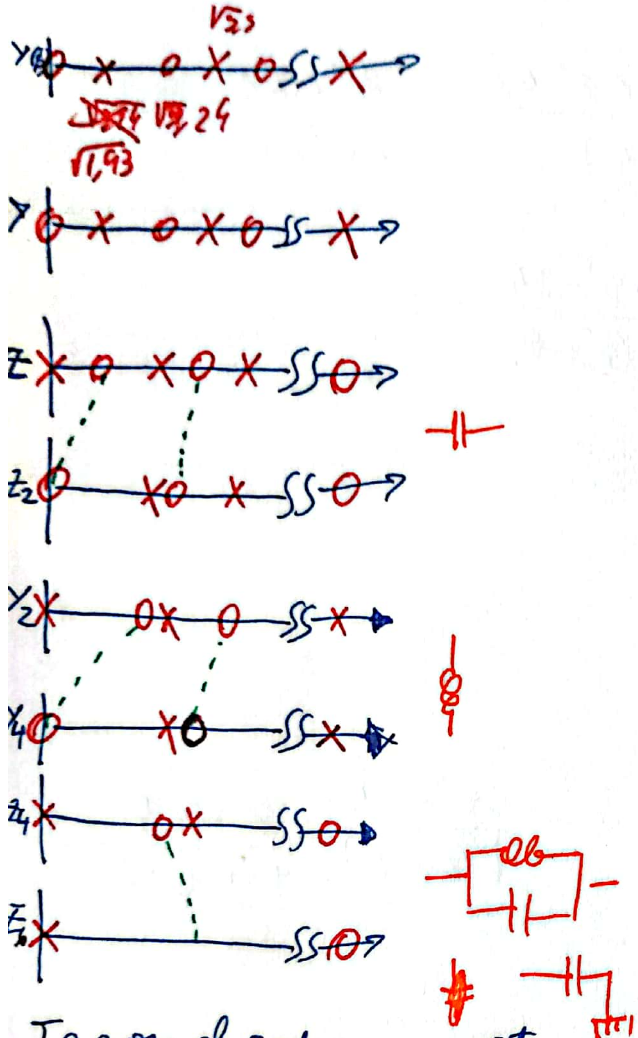
$\dfrac{360}{31}s^3 \;\big|\; 8s^4 \qquad \dfrac{45}{31}\dfrac{1}{s}$

0

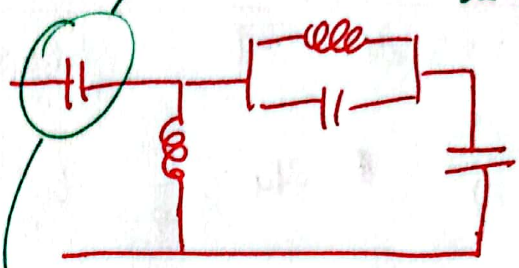


HOJA 2

③ $Y(s) = \dfrac{s^5+18s^3+48s}{6s^4+42s^2+48} = \dfrac{s(s^2+14,67)(s^2+3,24)}{6(s^2+5,5)(s^2+\cancel{4})}$ $1,43$



Esto en serie primero resuelvo en ②



Es un cero resonador en el origen

Tenemos el reductor capacitor

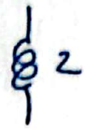
$$Z(s) = \frac{6s^4+42s^2+48}{s^5+18s^3+48s}$$

$$K_{01} = \lim_{s\to 0} s\,\frac{6s^4+42s^2+48}{(s^4+18s^2+48)s} = 1 \qquad \frac{1}{s} =$$

$$Z_2(s) = \frac{6s^4+42s^2+48}{(s^4+18s^2+48)s} - \frac{1}{s} = \frac{6s^4+42s^2+48-s^4-18s^2-48}{s(s^4+18s^2+48)}$$

$$Z_2(s) = \frac{5s^4+24s^2}{s(s^4+18s^2+48)} = \frac{5s^3+24s}{s^4+18s^2+48}$$

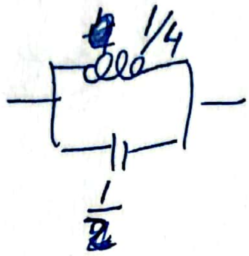
$Y_2(p) = \frac{p^4 + 18p^2 + 48}{5p^3 + 24p}$ $\qquad K_{02} = \lim_{p \to 0} p \, \frac{p^4 + 18p^2 + 48}{p(5p^2+24)} = 2$



$$Y_4(p) = \frac{p^4 + 18p^2 + 48}{p(5p^2+24)} - \frac{2}{p} = \frac{p^4 + 18p^2 + 48 - 10p^2 - 48}{p(5p^2+24)} = \frac{p^3 + 8p}{5p^2+24}$$

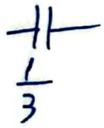
$Z_4 = \frac{5p^2+24}{p(p^2+8)}$ $\qquad 2K_4 = \lim_{p^2 \to -8} \frac{\cancel{p^2+8}}{p} \, \frac{5p^2+24}{p(\cancel{p^2+8})} = 2$

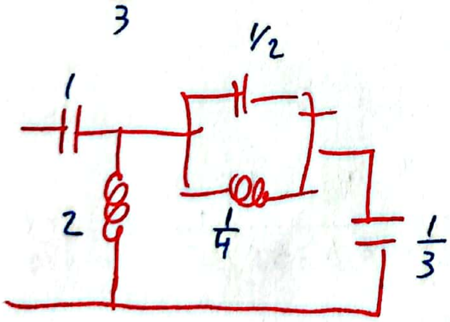
$z_i = \frac{2p}{p^2+8} = \frac{1}{\frac{p}{2} + \frac{4}{p}}$



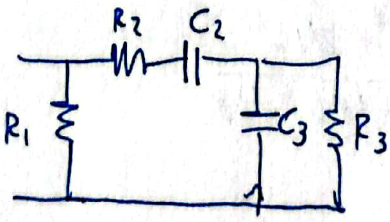
$$Z_6 = \frac{5p^2+24}{p(p^2+8)} - \frac{2p}{p^2+8} = \frac{5p^2+24-2p^2}{p(p^2+8)} = \frac{3p^2+24}{p(p^2+8)} = \frac{3(\cancel{p^2+8})}{p(\cancel{p^2+8})} = \frac{3}{p}$$

$z_6 = \frac{1}{\frac{1}{3}p}$

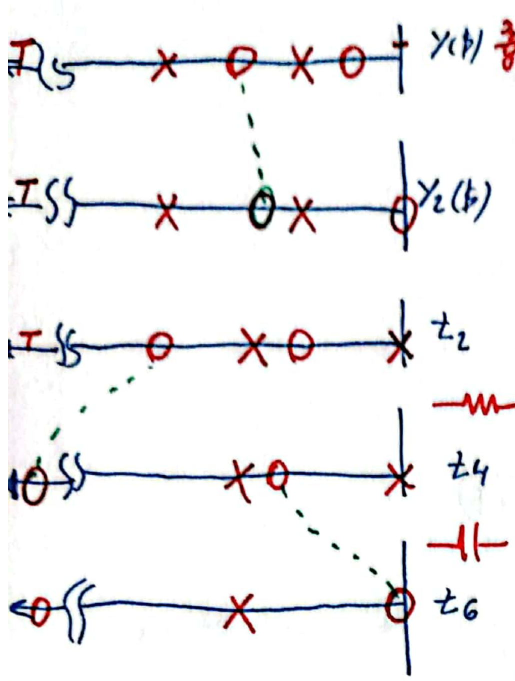




#4 $Y(p) = \frac{(p+1)(p+3)}{(p+2)(p+4)} = \frac{p^2+4p+3}{p^2+6p+8}$



$R_1 = \frac{7}{3}$



y aca que hacemos ¿?

$$k = \frac{8}{7}$$

$$Y(s) = \frac{8}{7} \cdot \frac{s^2+4s+3}{s^2+6s+8}$$

$$\lim_{s\to\infty} = \frac{3}{7}$$

$$\lim_{s\to 0} = \frac{8}{7} \qquad \frac{8}{7} > \frac{3}{7}$$

$$Y(s) = \frac{8}{7}\,\frac{s^2+4s+3}{s^2+6s+8} \qquad K_1 = \lim_{s\to\infty} Y(s) = \frac{3}{7} \qquad Y_1 = \frac{3}{7} \Rightarrow \boxed{R_1 = \frac{7}{3}}$$

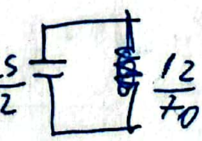
$$Y_2(s) = \frac{8}{7}\,\frac{s^2+4s+3}{s^2+6s+8} - \frac{3}{7} = \frac{8s^2+32s+24-3s^2-18s-24}{7(s^2+6s+8)} = \frac{5s^2+14s}{7(s^2+6s+8)}$$

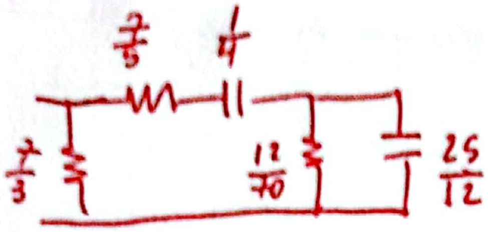
$$Z_2 = \frac{7s^2+42s+56}{5s^2+14s} \qquad K_2 = \lim_{s\to\infty} Z_2(s) = \frac{7}{5} \Rightarrow \frac{7}{5}$$

$$Z_4 = \frac{7s^2+42s+56}{5s^2+14s} - \frac{7}{5} = \frac{\frac{112}{5}s+56}{5s^2+14s}$$

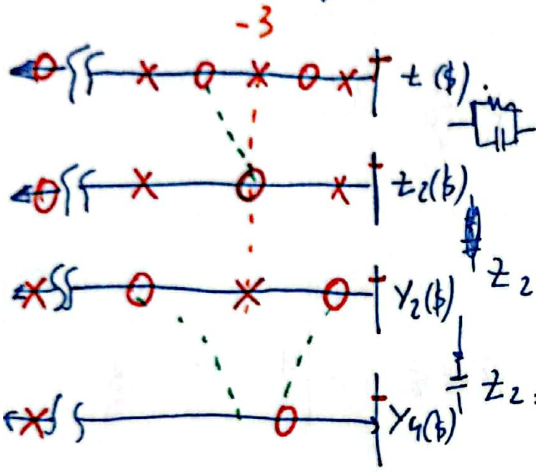
$$Z_6 = \frac{\frac{112}{5}s+56}{5s^2+14s} - \frac{4}{s} \qquad K_6 = \lim_{s\to 0} s\,Z_4(s) = 4$$

$$Z_6 = \frac{\frac{112}{5}s+56-20s-56}{s(5s+14)} = \frac{\frac{12}{5}s}{s(5s+14)} = \frac{12}{25s+70} =$$





#5/ $z(s) = \dfrac{s^2+6s+8}{s^3+9s^2+23s+15} = \dfrac{(s+2)(s+4)}{(s+1)(s+3)(s+5)}$



¿Como se cual de los dos ceros se coloca? hay que evaluar cual sirve.

$z_2 = z(s) - \dfrac{k}{s+3}$ $\qquad k = \lim_{s\to -3} \cancel{(s+3)} \dfrac{(s+2)(s+4)}{(s+1)\cancel{(s+3)}(s+5)} = \dfrac{1}{4}$

$z_2 = \dfrac{s^2+6s+8}{(s^2+6s+5)(s+3)} - \dfrac{\frac{1}{4}}{s+3} = \dfrac{s^2+6s+8-\frac{1}{4}s^2-\frac{3}{2}s-\frac{5}{4}}{(s^2+6s+5)(s+3)}$

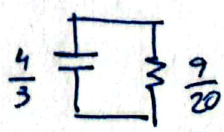
$z_2 = \dfrac{\frac{3}{4}s^2+\frac{9}{2}s+\frac{27}{4}}{(s^2+6s+5)(s+3)} = \dfrac{(s+3)\cancel{(s+3)}\frac{3}{4}}{(s^2+6s+5)\cancel{(s+3)}}$

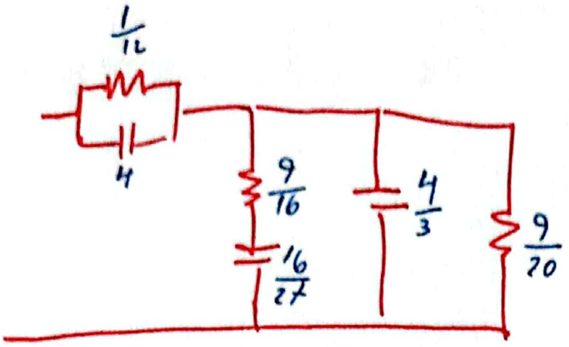
$z_2 = \dfrac{(s+3)\,3/4}{s^2+6s+5}$ $\qquad Y_2 = \dfrac{s^2+6s+5}{(s+3)\frac{3}{4}}$

$Y_4 = \dfrac{4s^2+24s+20}{3(s+3)} - \dfrac{16s}{9(s+3)}$ $\qquad K_4 = \lim_{s\to -3} \dfrac{\cancel{(s+3)}}{s} \dfrac{(s^2+6s+5)}{\cancel{(s+3)}\frac{3}{4}} = \dfrac{16}{9}$

$Y_4 = \dfrac{12s^2+72s+60-16s}{3(s+3)3} = \dfrac{12s^2+56s+60}{9(s+3)} = \dfrac{\cancel{(s+3)}(s+5/3)12}{9\cancel{(s+3)}}$

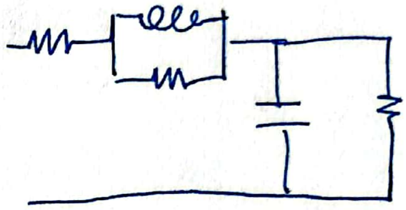
$Y_4 = \dfrac{(s+\frac{5}{3})12}{9} = (s+\frac{5}{3})\frac{4}{3} = s\frac{4}{3} + \frac{20}{9}$

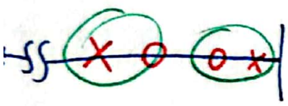




$$\frac{16s}{9s+27} = \frac{16}{9+\frac{27}{s}} = \frac{1}{\frac{9}{16}+\frac{27}{16s}}$$

#6 $Z(s) = \dfrac{s^2+6s+8}{s^2+6s+5} = \dfrac{(s+2)(s+4)}{(s+1)(s+5)}$





que odo aca ¿?

$\cancel{Z(s)}$ $k_1 = \left.\right|_{s=-1} \dfrac{\cancel{(s+1)}(s+2)(s+4)}{\cancel{(s+1)}(s+5)} = \dfrac{3}{4}$ Tagg RC

$k_2 = \left.\right|_{s=-5} \dfrac{\cancel{(s+5)}(s+2)(s+4)}{(s+1)\cancel{(s+5)}} = \dfrac{(-3)(-1)}{(-4)} = -\dfrac{3}{4}$ Lato RL

$k_2 = \left.\right|_{s=-5} \dfrac{\cancel{(s+5)}\overset{-3}{(s+2)}\overset{(-1)}{(s+4)}}{\underset{(-5)}{s}\underset{(-4)}{(s+1)}\cancel{(s+5)}} = \dfrac{-3}{-20} = \dfrac{3}{20}$

$\cancel{Z_2 = \dfrac{s^2+6s+8}{(s+1)(s+5)} - \dfrac{\frac{3}{20}s}{(s+5)} = \dfrac{s^2+6s+8-\frac{3}{20}s^2-\frac{3}{20}}{(s+1)(s+5)} = \dfrac{\frac{17}{20}s^2+ \dots}{(s+1)(s+5)}}$ $+\frac{157}{20}$ $6s+\dots$

$\cancel{Z_2 =}$

$$Z_2 = \frac{s^2+6s+8}{(s+1)(s+5)} - \frac{3s}{20(s+5)} = \frac{20s^2+120s+160-3s^2-3s}{(s+1)(s+5)\,20} = 20s^2+117s+160$$

HOJA 5

7/ ~~7~~

$$s^2 + 2\xi w_n s + w_n^2 = s^2 + s + \frac{1}{4}$$

$w_n = 1$

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

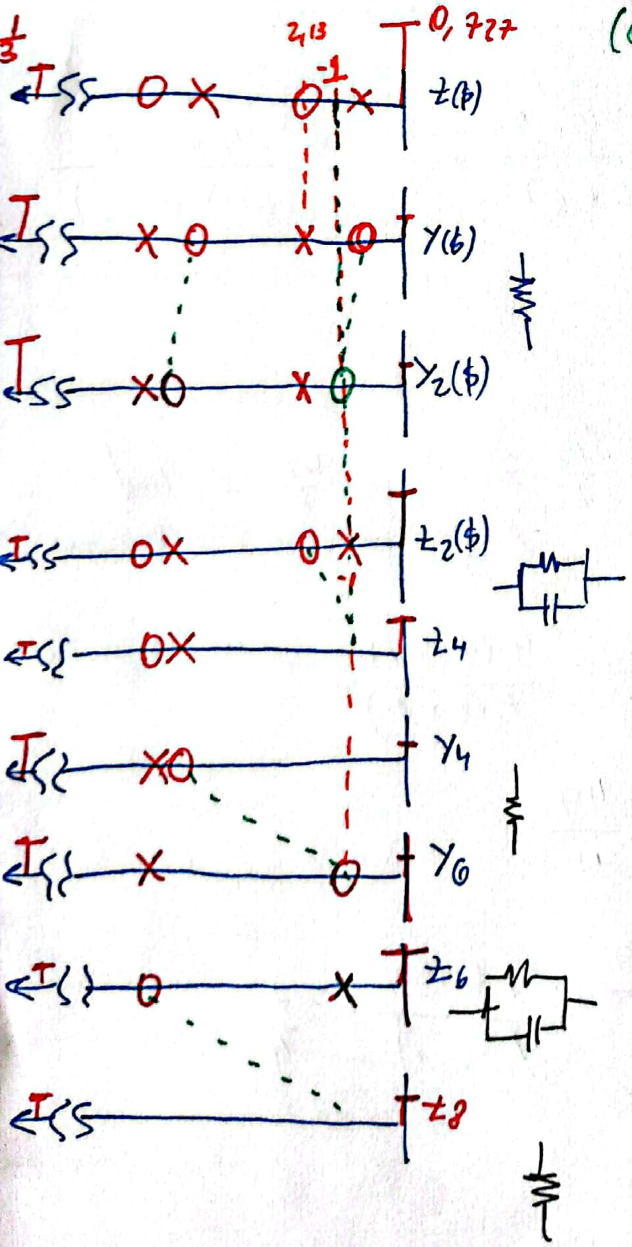
$s_1 = -1 \quad s_2 = \sqrt{5}\; e^{j116,6}$ → Not TODAY.

8#

$$Z(s) = \frac{s^2 + 13s + 32}{3s^2 + 27s + 44} \qquad Y(s) = \frac{3s^2 + 27s + 44}{s^2 + 13s + 32} \qquad C, R, = 1$$

$$Z(s) = \frac{(s+3,3)(s+9,7)}{(s+2,13)(s+6,86)3} \qquad Y(s) = \frac{3(s+2,13)(s+6,86)}{(s+3,3)(s+9,7)}$$

(a lo sumo puedo remover a $\frac{1}{3}$ en ∞)



$$Y(s) = \frac{3s^2+27s+44}{s^2+13s+32} \Rightarrow \frac{1}{0,+22} \text{ no puedo factor}$$

$$Y(s) - K_{\infty 1}\Big|_{s=-1} = 0 = \frac{3s^2+27s+44}{s^2+13s+32}\Bigg|_{s=-1} = K_{\infty 1} = \frac{3-27+44}{1-13+32} = \frac{20}{20} = 1$$

$$Y_2(s) = Y(s) - K_{\infty 1} = \frac{3s^2+27s+44}{s^2+13s+32} - 1 = \frac{3s^2 - s^2 + 27s - 13s + 44 - 32}{s^2+13s+32}$$

$$Y_2(s) = \frac{2s^2+14s+12}{s^2+13s+32} = \frac{2(s+1)(s+6)}{s^2+13s+32}$$

$$Z_2(s) = \frac{s^2+13s+32}{2(s+1)(s+6)} \qquad K_2 = \lim_{s\to -1} \cancel{(s+1)}\frac{(s^2+13s+32)}{\cancel{(s+1)}(s+6)2} = 2$$

$$Z_4(s) = \frac{s^2+13s+32}{2(s+1)(s+6)} - \frac{2}{s+1} = \frac{s^2+13s+32-4s-24}{2(s+1)(s+6)} = \frac{s^2+9s+8}{2(s+1)(s+6)}$$

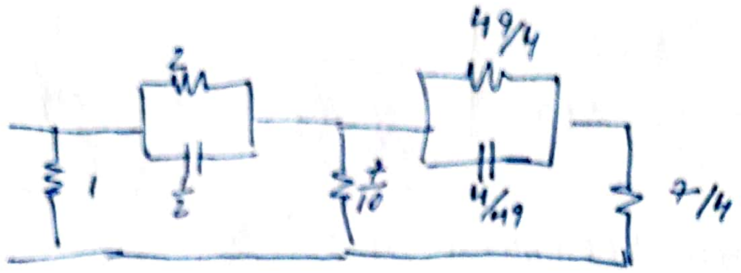
$$Z_4(s) = \frac{\cancel{(s+1)}(s+8)}{2\cancel{(s+1)}(s+6)} = \frac{s+8}{2(s+6)}$$

$$Y_4(s) = \frac{2s+12}{s+8} \qquad K_{\infty 4} = \frac{2s+12}{s+8}\Bigg|_{s=-1} = \frac{10}{7} \qquad \frac{10}{7} > \frac{12}{8} \Rightarrow \text{puedo remover}$$

$$Y_6(s) = \frac{2s+12}{s+8} - \frac{10}{7} = \frac{14s+84-10s-80}{7(s+8)} = \frac{4(s+1)}{7(s+8)}$$

$$Z_6 = \frac{7(s+8)}{4(s+1)} \qquad K_6 = \lim_{s\to -1} \cancel{(s+1)} \frac{7(s+8)}{4\cancel{(s+1)}} = \frac{49}{4}$$

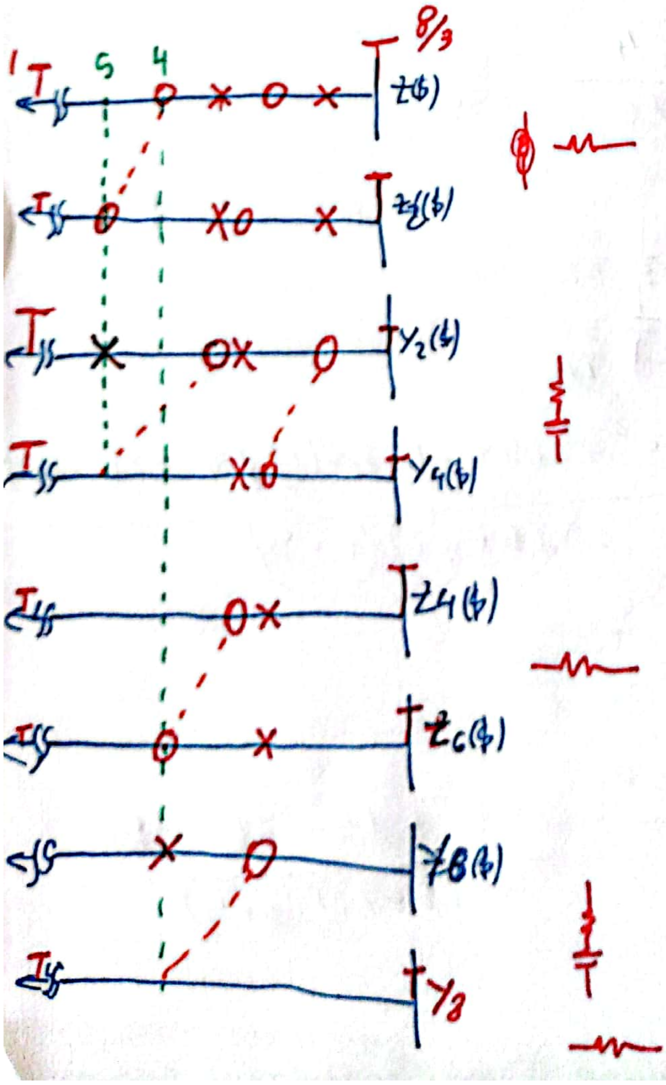
$$Z_8 = \frac{7}{4}\,\frac{s+8}{s+1} - \frac{49}{4(s+1)} = \frac{7s+56-49}{4(s+1)} = \frac{7s+7}{4(s+1)} = \frac{7}{4}$$



$$\frac{2}{s+1} = \frac{1}{\frac{s}{2}+\frac{1}{2}}$$

$$\frac{49}{4s+4} = \frac{1}{\frac{4s}{49}+\frac{4}{49}}$$

#9/ $z(s) = \dfrac{s^2+6s+8}{s^2+4s+3} = \dfrac{(s+2)(s+4)}{(s+1)(s+3)}$ Necesito un cero a (4), y dos a ⊖



$$Z(s) = \frac{s^2+6s+8}{s^2+4s+3} \qquad K_{\infty_2} = \left.\frac{s^2+6s+8}{s^2+4s+3}\right|_{s=-5} = \frac{3}{8} < 1 \text{ yoğun pütor.}$$

$$\frac{3}{8}$$

$$Z_2(s) = \frac{s^2+6s+8}{s^2+4s+3} - \frac{3}{8} = \frac{8s^2+48s+64-3s^2-12s-9}{8(s^2+4s+3)}$$

$$Z_2(s) = \frac{5s^2+36s+55}{8(s^2+4s+3)} = \frac{5(s+2{,}2)(s+5)}{8(s^2+4s+3)} \qquad Y_2 = \frac{8(s^2+4s+3)}{5(s+2{,}2)(s+5)}$$

$$\cancel{K_4 = \lim_{s\to -5} (s+5)\frac{8(s^2+4s+3)}{(s+5)(s+2{,}2)5} = \frac{-96}{-14} = \frac{48}{7}}$$

$$\cancel{\frac{48}{7(s+5)} = \frac{1}{\frac{7s}{48}+\frac{35}{48}}} \qquad \cancel{\frac{7}{48}}$$

Lon reti.

$$K_4 = \lim_{s\to -5} \frac{\cancel{s+5}}{s}\,\frac{8(s^2+4s+3)}{(\cancel{s+5})(s+2{,}2)5} = \frac{64}{70} = \frac{32}{35}$$

$$\frac{32s}{35s+175} = \frac{1}{\frac{35}{32}+\frac{175}{32s}}$$

$$\frac{35}{32} \qquad \frac{32}{175}$$

$$Y_4 = \frac{8s^2+32s+24}{5(s+2{,}2)(s+5)} - \frac{32s}{\underset{7\times5}{35}(s+5)} = \frac{56s^2+224s+168-32s^2-70{,}4s}{35(s+2{,}2)(s+5)}$$

$$\cancel{Y_4 = \frac{56s^2+192s+97{,}6}{35(s+2{,}2)(s+5)}}$$

$$Y_4 = \frac{56s^2-32s^2+224s-70{,}4s+168}{35(s+2{,}2)(s+5)} = \frac{24s^2+153{,}6s+168}{35(s+2{,}2)(s+5)}$$

$$Y_4 = \frac{(\cancel{s+5})(s+1{,}4)24}{(\cancel{s+5})(s+2{,}2)35}$$

HOJA 7

$$Z_4 = \frac{35(\$+2,2)}{24(\$+1,4)} = \frac{35(\$+\frac{11}{5})}{24(\$+\frac{7}{5})} = \frac{35\$+77}{24\$+\frac{168}{5}} =$$

$$K_6 = \frac{-63}{-62,4} = \frac{105}{104}$$

$$Z_6 = \frac{35\$+77}{24\$+\frac{168}{5}} - \frac{105}{104} = \frac{35\$+77 - \frac{105}{104}\left(24\$+\frac{168}{5}\right)}{24\$+\frac{168}{5}} = \frac{\frac{140}{13}\$+\frac{560}{13}}{24\$+\frac{168}{5}}$$

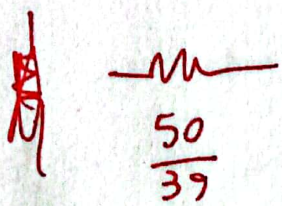
$$Z_6 = \frac{\frac{140}{13}(\$+4)}{24\$+\frac{168}{5}}$$

$$Y_6 = \frac{24\$+\frac{168}{5}}{\frac{140}{13}(\$+4)}$$

$$K_8 = \cancel{\frac{9}{\$\to -4}} \; \frac{\cancel{\$+4}}{\$} \; \frac{24\$+\frac{168}{5}}{\frac{140}{13}(\cancel{\$+4})} = \frac{507}{350}$$

$$Y_8 = \frac{24\$+\frac{168}{5}}{\frac{140}{13}(\$+4)} - \frac{\frac{507}{350}\$}{(\$+4)} = \frac{24\$+\frac{168}{5} - \frac{78}{5}\$}{\frac{140}{13}(\$+4)} = \cancel{\frac{24\$+\frac{168}{5}}{\frac{140}{13}(\$+4)}}$$

$$Y_8 = \frac{\frac{48}{5}\$+\frac{168}{5}}{\frac{140}{13}(\$+4)} = \frac{\frac{42}{5}(\cancel{\$+4})}{\frac{140}{13}(\cancel{\$+4})} = \frac{42}{5}\cdot\frac{13}{140} = \frac{39}{50}$$



$\frac{50}{39}$