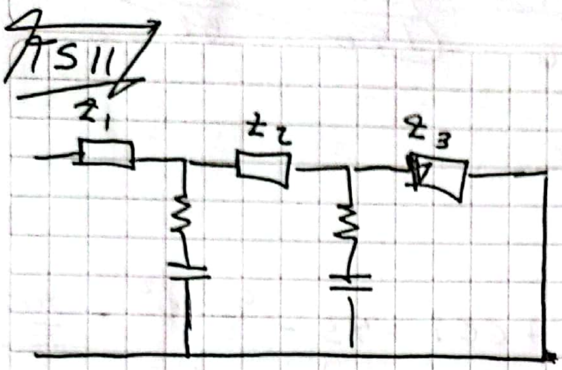
TS11

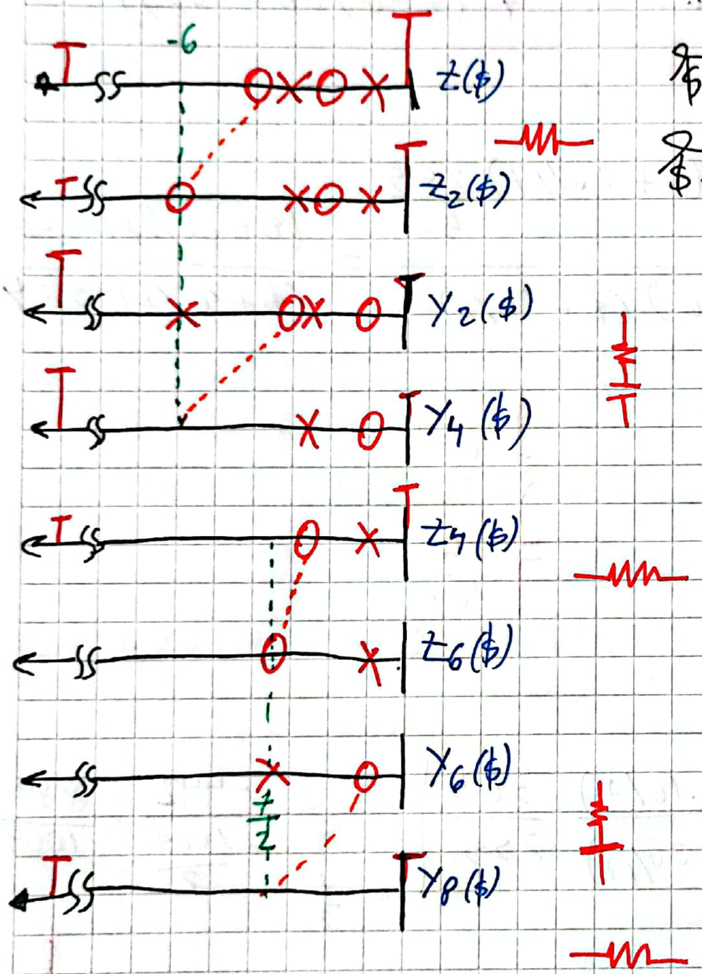


$R_1C_1 = \frac{1}{6}$ $\qquad R_2C_2 = \frac{2}{7}$

$$Z(s) = \frac{(s+2)(s+4)}{(s+1)(s+3)} = \frac{s^2+6s+8}{s^2+4s+3}$$

$$\lim_{s\to 0} Z(s) = \frac{8}{3}$$

$$\lim_{s\to \infty} Z(s) = 1$$



$$Z(s) = \frac{s^2+6s+8}{s^2+4s+3} \qquad K_2 = \frac{s^2+6s+8}{s^2+4s+3}\Bigg|_{s=-6} = \frac{8}{15}$$

8/15

$$Z_2(s) = Z(s) - K_2 = \frac{s^2+6s+8}{s^2+4s+3} - \frac{8}{15} = \frac{15s^2+90s+120-8s^2-32s-24}{15(s^2+4s+3)}$$

$$Z_2(s) = \frac{7s^2+58s+\overset{96}{\cancel{108}}}{15(s^2+4s+3)} = \frac{(s+6)(s+16/7)\,7}{15(s^2+4s+3)}$$

$$Y_2(s) = \frac{15(s^2+4s+3)}{(s+6)(s+16/7)\,7}$$

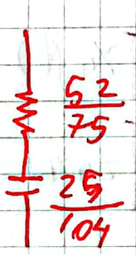
$$\cancel{K_4 = \lim_{s \to -6} \frac{(s+6)}{s} \frac{(s^2+4s+3)15}{7(s+6)(s+16/7)} = \frac{19 \cdot 15}{156} = \frac{285}{156} = \frac{95}{52}}$$

$$K_4 = \lim_{s \to -6} \frac{(s+6)}{s} \frac{15(s^2+4s+3)}{7(s+6)(s+16/7)} = \frac{75}{52}$$

$$Y_4 = \frac{15(s^2+4s+3)}{7(s+6)(s+16/7)} - \frac{\frac{75}{52}s}{s+6} = \frac{15s^2+60s+45-\frac{525}{52}s^2-\frac{300}{13}s}{7(s+6)(s+16/7)}$$

$$Y_4 = \frac{\frac{255}{52}s^2+s\frac{480}{13}+45}{7(s+6)(s+16/7)} = \frac{(s+6)(s+26/17)\frac{255}{52}}{7(s+6)(s+16/7)} = \frac{(s+26/17)\,255}{(s+16/7)\,364}$$

$$Y = \frac{\frac{75}{52}s}{s+6} = \frac{1}{\frac{52}{75}+\frac{104}{25s}}$$



$$Z_4 = \frac{(s+16/7)\,364}{(s+26/17)\,255}$$

$$K_6 = \frac{(s+16/7)}{(s+26/17)}\frac{364}{255}\Bigg|_{s=-\frac{7}{2}} = \frac{-442}{-\frac{1005}{2}} = \frac{884}{1005}$$

$$Z_6 = \frac{364s+832}{255s+390} - \frac{884}{1005} =$$

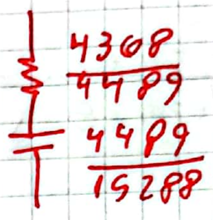
$$Z_6 = \frac{365820s+836160-225420s-344760}{1005(255s+390)}$$

$$Z_6 = \frac{140400s+491400}{1005(255s+390)} = \frac{140400(s+7/2)}{1005(255s+390)}$$

$$Y_6 = \frac{1005(255s+390)}{140400(s+7/2)}$$

$$K_8 = \left. \frac{\cancel{(s+7/2)}}{s} \cdot \frac{1005(255s+390)}{140400\cancel{(s+7/2)}} \right|_{s \to -\frac{7}{2}} = \frac{4489}{4368}$$

$$Y = \frac{\frac{4489}{4368}s}{s+\frac{7}{2}} = \frac{1}{\frac{4368}{4489} + \frac{15288}{s\,4489}}$$

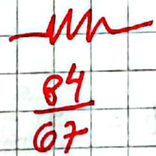


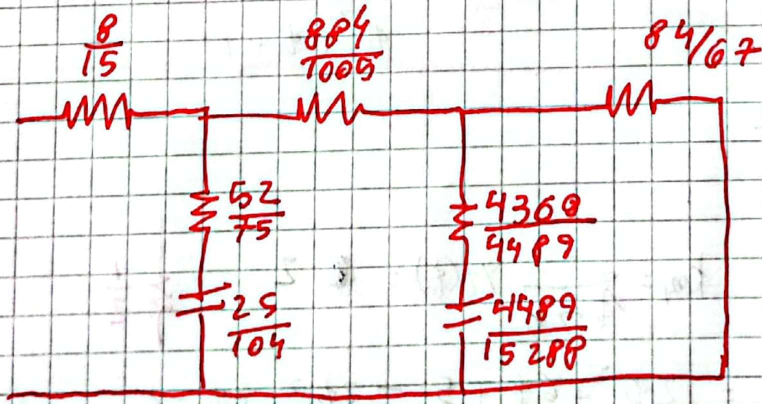
$$\cancel{Y_8 = 1005}$$

$$Y_8 = \frac{256275s + 391950}{140400\,(s+7/2)} - \frac{\frac{4489}{4368}s}{(s+\frac{7}{2})}$$

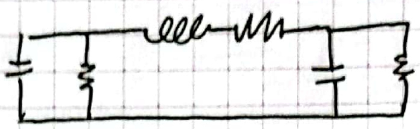
$$Y_8 = \frac{256275s - 140400 \times \frac{4489}{4368}s + 391950}{140400} = \frac{\frac{783900}{7}(s+\frac{7}{2})}{140400\,(s+7/2)}$$

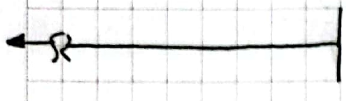
$$Y_8 = \frac{67}{84} \qquad Z_8 = \frac{84}{67}$$





$\boxed{2}$ $z(s) = \dfrac{s^2+s+1}{(s^2+2s+5)(s+1)}$





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$$z(s) = \frac{s^2+s+1}{s^2+2s+5}\ \frac{1}{s+1} \qquad Y(s) = \frac{(s^2+2s+5)(s+1)}{s^2+s+1}$$

$$Y_2(s) = \frac{(s^2+2s+5)(s+1)}{s^2+s+1} - K_{\infty 2}s$$

$$K_{\infty 2} = \lim_{s\to\infty} \frac{1}{s}\ \frac{s^3+s^2+2s^2+2s+5s+5}{s^2+s+1} = 1$$

1

$$\cancel{Y_2(s) = \frac{s^3+3s^2+7s+5}{s^2+s+1} - 1 = \frac{s^3+3s^2-s^2+7s-s+5-1}{s^2+s+1}}$$

$$\cancel{Y_2(s) = \frac{s^3+2s^2+6s+4}{s^2+s+1} =}$$

$$Y_2(s) = \frac{s^3+3s^2+7s+5}{s^2+s+1} - s = \frac{s^3-s^3+3s^2-s^2+7s-s+5}{s^2+s+1}$$

$$Y_2(s) = \frac{2s^2+6s+5}{s^2+s+1}$$

$$Y_4 = Y_2(s) - K_{\infty 4} \qquad K_{\infty 4} = \lim_{s\to\infty} Y_2(s) = 2$$

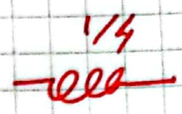
$\frac{1}{2}$

$$Y_4 = \frac{2s^2+6s+5}{s^2+s+1} - 2 = \frac{2s^2+6s+5-2s^2-2s-2}{s^2+s+1}$$

$$Y_4 = \frac{4s+3}{s^2+s+1}$$

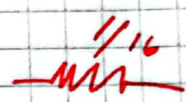
$$Z_4 = \frac{s^2+s+1}{4s+3}$$

$$Z_6 = Z_4 - K_{6\infty} \qquad K_{6\infty} = \lim_{s\to\infty} \frac{1}{s}\,\frac{s^2+s+1}{4s+3} = \frac{1}{4}$$



$$Z_6 = \frac{s^2+s+1}{4s+3} - \frac{1}{4}s = \frac{s^2+s+1-s^2-\frac{3}{4}s}{4s+3} = \frac{\frac{1}{4}s+1}{4s+3}$$

$$Z_8 = Z_6 - K_{\infty 6} \qquad K_{\infty 6} = \lim_{s\to\infty} \frac{\frac{1}{4}s+1}{4s+3} = \frac{1}{16}$$



$$Z_8 = \frac{\frac{1}{4}s+1}{4s+3} - \frac{1}{16} = \frac{\frac{1}{4}s+1-\frac{1}{4}s-\frac{3}{16}}{4s+3} = \frac{\frac{13}{16}}{4s+3}$$

$$Y_8 = \frac{4s+3}{\frac{13}{16}} = \frac{4s}{\frac{13}{16}} + \frac{3}{\frac{13}{16}} = \frac{64}{13}s + \frac{48}{13}$$