HP

$f_p = 100$ $\quad \omega_p = 2\pi 100$

$f_s = 20$ $\quad \omega_s = 2\pi 25$

LP

$\omega_p = \frac{1}{2\pi 100}$

$\omega_s = \frac{1}{2\pi 20}$

$$\omega_c = \frac{f_p}{(10^{\alpha/10}-1)^{\frac{1}{2N}}} = \frac{\frac{1}{2\pi 100}}{(10^{2/10}-1)^{\frac{1}{6}}}$$

$$= \frac{\frac{1}{2\pi 100}}{.914} = \frac{1}{2\pi 91.4}$$

(2)

\# of poles:

(1)
$$N \geq \frac{\log_{10}\left[(10^{3/10}-1)/(10^{2/10}-1)\right]}{2\log_{10}\left(\frac{100}{20}\right)} = 2.31 \qquad \text{use } (3)$$

Low pass prototype: $\left(s \to \frac{s}{\omega}\right)$

(3)
$$\frac{1}{(s+1)(s^2+s+1)} \Rightarrow \frac{1}{(s(2\pi 100)+1)\left((s(2\pi 100))^2 + s(2\pi 100)+1\right)}$$

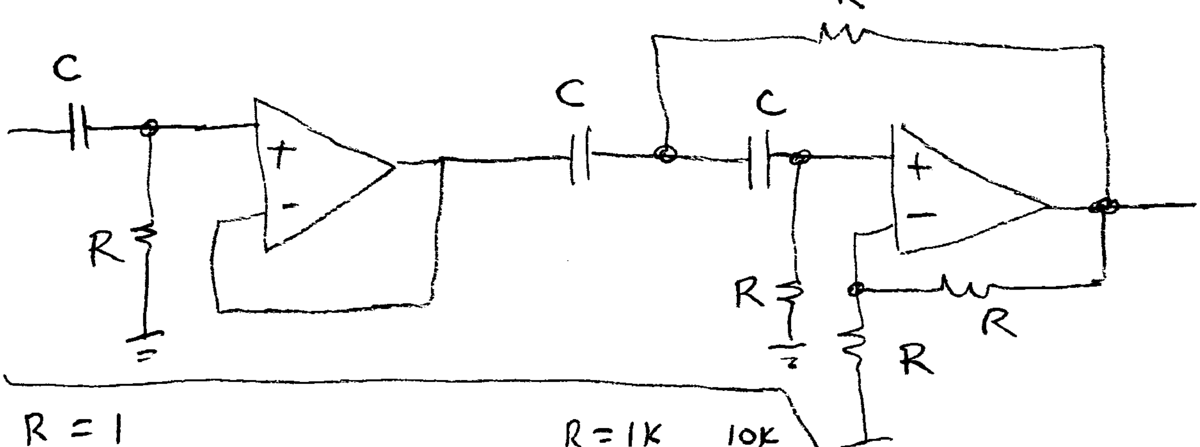
Transform to high pass: $\left(s \to \frac{1}{s}\right)$

(4)
$$\frac{1}{\left(\frac{2\pi 91.4}{s}+1\right)\left(\frac{(2\pi 91.4)^2}{s^2} + \frac{2\pi 91.4}{s}+1\right)} =$$

simplify

$$\frac{s^3}{(2\pi 91.4 + s)\left((2\pi 91.4)^2 + s(2\pi 91.4) + s^2\right)} = \frac{\frac{s^3}{(2\pi 100)^3}}{\left(1+\frac{s}{2\pi 91.4}\right)\left(1+\frac{s}{2\pi 91.4}+\frac{s^2}{(2\pi 91.4)^2}\right)}$$

(5)



(6)

$R = 1$

$C = \frac{1}{2\pi 91.4} = \frac{1}{575} \approx .0017\,F$

$R = 1K \quad 10K$

$C = 1.7\mu f \quad .17\mu f$