# Tarea: Diseño de filtro Butterworth pasa bandas

$Fs = 60.1\ KHz$
$fp = 3\ KHz$
$fs = 8\ KHz$

$\alpha p = -20 \log_{10}(1 - \delta p)$ = menor que 3db
$\alpha s = -20 \log(\delta s)$ = menor que 25 db

$$Wp = 2\pi (fp/Fs) = 2\pi \left(\frac{3\ KHz}{60.1\ KHz}\right) = 0.3136$$

$$Ws = 2\pi (fs/Fs) = 2\pi \left(\frac{8\ KHz}{60.1\ KHz}\right) = 0.8363$$

$$1 - 10^{\wedge}\left(-\frac{\alpha p}{20}\right) = \delta p - \delta p = 0.292$$

$$10^{\wedge}\left(\frac{\alpha s}{20}\right) = \delta s = 0.056$$

$$N = \frac{1}{2} \frac{\log\left(1/(1-0.292)^2 - 1\right) - \log\left(1/0.056)^2 - 1\right)}{\log\left(\frac{0.3136}{0.8363}\right)}$$

$$N = \frac{-2.1957 \times 10^{-3} - 2.562}{-0.425} = 6$$

$$\Omega c = \frac{Wp}{\left(\frac{1}{(1-0.292)^2} - 1\right)^3} = \frac{0.3136}{0.98} = 0.318$$

$$H(\Omega) = \frac{0.0010}{S^6 + 1.23S^5 + 0.755S^4 + 0.291S^3 + 0.0765S^2 + 0.0126S + 0.07}$$