Tarea

1) Diseñe y elabore un filtro pasa bajo de Butterworth

$f_s = 60.1\ KHz$,

banda de paso de 3.0 KHz hasta banda de 3 dB
banda stop 8.0 KHz pendiente de Banda de stop 25 dB

$$\alpha_p = -20 \log_{10}(1 - \delta_p) < 3\,dB$$
$$\alpha_s = -20 \log_{10}(\delta_s) < 25\,dB$$

$$W_p = 2\pi(f_p / F_s) = 0.3136365$$

$$W_s = 2\pi(f_s / F_s) = 0.836364$$

$$1 - 10^{\left(\frac{-\alpha_p}{20}\right)} = \delta_p = 0.242054$$

$$10^{\left(\alpha_s/20\right)} = \delta_s = 0.056$$

$$N = \frac{1}{2}\,\frac{\log\left(\frac{1}{(1-0.242)^2} - 1\right) - \log\left(\frac{1}{0.056^2} - 1\right)}{\log\left(\frac{0.31363}{0.836364}\right)} = \frac{-2.143747 \times 10^{-3} - 7.562^2}{-0.42596}$$

$$N = 6$$

$$\Omega_c = \frac{w_p}{\left(\frac{1}{(1-0.242)^2} - 1\right)^3} = \frac{0.31363}{0.9849} = 0.3184$$

$$H(\Omega) = \frac{0.0010}{15^6 + 1.23025^5 + 0.75675^4 + 0.245^3 + 0.076^2 + 0.0126 + 0.0010}$$