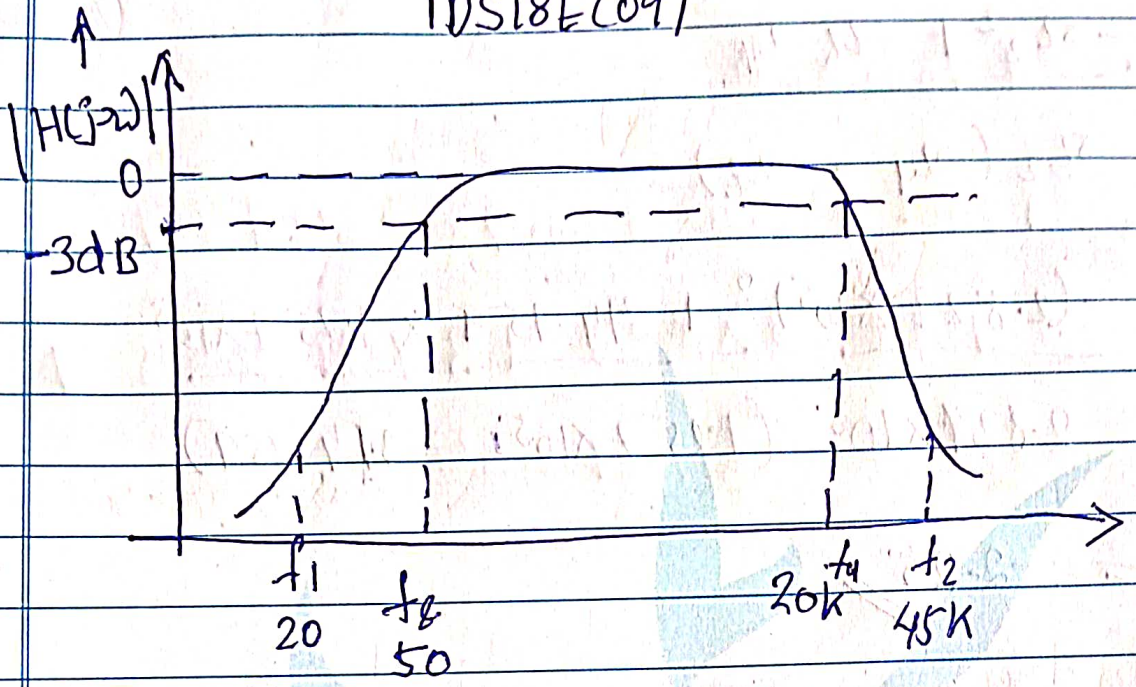
1DS18EC091



$\omega_1 = 2\pi f_1 = 2\pi \times 20 = 125.663$ rad/s //

$\omega_2 = 2\pi f_2 = 2\pi \times 45 \times 10^3 = 2.827 \times 10^5$ rad/s //

$\omega_b = 2\pi f_b = 2\pi \times 50 = 314.159$ rad/s //

$\omega_4 = 2\pi f_4 = 2\pi \times 20 \times 10^3 = 1.257 \times 10^5$ rad/s //

$$A = \frac{-\omega_1^2 + \omega_2 \omega_4}{\omega_1(\omega_4 - \omega_1)}$$

$$A = \frac{-(125.663)^2 + 3.14.159 \times 1.257 \times 10^5}{125.663(1.257 \times 10^5 - 314.159)}$$

$A = 2.51$ //

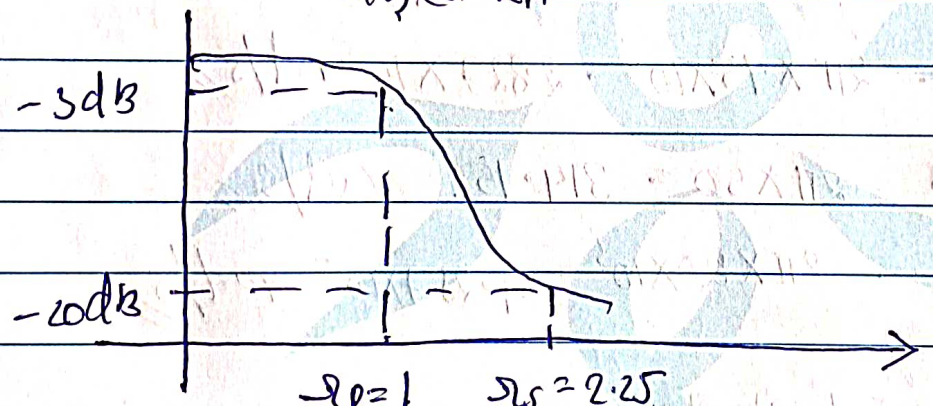
$$B = \frac{-\Omega_2^2 + \Omega_6 \Omega_4}{\Omega_2(-\Omega_4 - \Omega_6)}$$

$$= \frac{-(2.829 \times 10^5)^2 + 314.159 \times 1.257 \times 10^5}{2.827 \times 10^5 \ (1.257 \times 10^5 - 314.159)}$$

$$= -2.25 //$$

$$\Omega_s = \min(|A|, |B|) = 2.25 //$$

Normalized LPF



$$N = \log\left[\frac{10^{-0.1K_p} - 1}{10^{-0.1K_s} - 1}\right] = \log\left[\frac{10^{-0.1(-3)} - 1}{10^{-0.1(-20)} - 1}\right]$$

$$2 \log\left(\frac{\Omega_p}{\Omega_s}\right) \qquad 20 \log\left(\frac{1}{2.25}\right)$$

$N = 2.83 \Rightarrow 3$ //

$$H_n(s) = \frac{1}{(s+0.207+j0.707)(s+0.207-j0.707)(s+1)}$$

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

$$H_n(s) = \frac{1}{s_n^3 + 2s_n^2 + 2s + 1}$$

$$H_a(s) = H_n(s)\Big|_{s \to \frac{s^2+s\omega_1}{s(s\omega_1-\omega_1)}} \Rightarrow \frac{s^2+3.949\times10^7}{s(1.2538\times10^5)}$$

$$H_a(s) = \frac{1}{\left[\frac{s^2+3.949\times10^7}{s(1.2538\times10^5}\right]^3 + 2\left[\frac{s^2+3.949\times10^7}{s\,[1.2538\times10^5}\right]^2 + 2\left[\frac{s^2+3.947\times10^7}{s\,[1.2538\times10^5}\right] + 1}$$

$$Ha(s) = \frac{1.9695 \times 10^{15} s^3}{s^6 + 2.506 \times 10^5 s^5 + 3.154 \times 10^{10} s^4 + 1.989 \times 10^{15} s^3 + 1.245 \times 10^{18} s^2 + 3.9073 \times 10^{20} s + 6.1529 \times 10^{22}}$$