

Solution

$$1. A_v = V_o/V_i = \frac{R_2}{R_1 + R_2 + 1/jC\omega} = \frac{R_2}{R_1 + R_2} \times \frac{1}{1 + 1/jC\omega(R_1 + R_2)}$$

$$A_v = \frac{R_2}{R_1 + R_2} \times \frac{j\omega C(R_1 + R_2)}{1 + j\omega C(R_1 + R_2)} = G_m \cdot \frac{j\omega/\omega_0}{1 + j\omega/\omega_0}$$

A_v est une fonction de transfert d'un filtre RL passe-haut 1^{er} ordre

$$2. \omega_0 = 1/C(R_1 + R_2) = 2\pi f_c \quad \boxed{f_c = 1/2\pi C(R_1 + R_2)}$$

$$f_c = 1 / (2\pi \times 10^{-9}F \times 20 \cdot 10^3\Omega) \quad \boxed{f_c = 7,96kHz}$$

$$G_m = \frac{R_2}{R_1 + R_2} \quad G_m = 10 / (10 + 10) \quad \boxed{G_m = 0,5}$$

$$3. |A_v| = \frac{V_o}{V_i} = G_m \frac{\frac{\omega}{\omega_0}}{\sqrt{1 + \left(\frac{\omega}{\omega_0}\right)^2}} = G_m \frac{\frac{f}{f_c}}{\sqrt{1 + \left(\frac{f}{f_c}\right)^2}}$$

$$\text{à } f = f_c \quad |A_v| = \frac{1}{2\sqrt{2}}$$

$$G(dB) = 20\log|A_v| = 20\log 1/2\sqrt{2} \quad \boxed{G(dB) = -9}$$

$$\varphi = 90^\circ - \text{Arctg } \omega/\omega_0 = 90^\circ - 45^\circ \quad \boxed{\varphi = 45^\circ}$$