

Solution

1.

$$A_v = \frac{1/jC\omega}{R + 1/jC\omega} = \frac{1}{1 + jRC\omega} = \frac{1}{1 + j\omega/\omega_0}$$

$$|A_v| = \frac{1}{\sqrt{1 + (\frac{\omega}{\omega_0})^2}} = \frac{1}{\sqrt{1 + (\frac{f}{f_c})^2}}$$

2. $\omega_0 = RC = 2\pi f_c \Rightarrow f_c = 1/2\pi RC = 7,96 \text{ kHz}$ (fréquence de coupure)

3. à la fréquence de coupure : $f = f_c$

$$|A_v| = \frac{U_s}{U_e} = \frac{1}{\sqrt{1 + (\frac{f}{f_c})^2}} = \frac{1}{\sqrt{1 + (1)^2}} = \frac{1}{\sqrt{2}}$$

$$U_s = \frac{10}{\sqrt{2}} = 7,07V$$

$$G(\text{dB}) = 20\log|A_v| = 20\log \frac{1}{\sqrt{2}}$$

$$G(\text{dB}) = -3\text{dB}$$

$$\varphi = -\text{Arctg } \omega/\omega_0 = -\text{Arctg } 1$$

$$\varphi = -45^\circ$$

4. $G(\text{dB}) = 20 \log |A_v| = 20 \log \frac{1}{\sqrt{1 + (\frac{\omega}{\omega_0})^2}} = 20 \log 1 - 10 \log (1 + (\omega / \omega_0)^2)$

$$G(\text{dB}) = -10 \log (1 + (\omega / \omega_0)^2) = -10 \log (1 + (f/f_c)^2)$$

$$\varphi = -\text{Arctg } \omega/\omega_0 = -\text{Arctg } f/f_c$$

	f(Hz)	Us(V)	Av(dB)	φ (degré)
f _c	7957,75	7,07	- 3,01	- 45,00
f _c /10	795,77	9,95	- 0,04	- 5,71
f _c /2	3978,87	8,94	- 0,97	- 26,57
2f _c	15915,49	4,47	- 6,99	- 63,43
10f _c	79577,47	1,00	- 20,04	- 84,29

5.

