

Correction du TD PHYS2 – suite

Exercice 3 (suite)

$$5) \text{ d'après } Q1: \underline{u_e} = \underline{u_s} \left(3 + jRC\omega + \frac{1}{jRC\omega} \right)$$

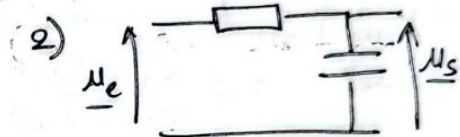
$$\Rightarrow \frac{1}{RC} \times j\omega \underline{u_e} = \frac{3}{RC} j\omega \underline{u_s} + (j\omega)^2 \underline{u_s} + \frac{1}{(RC)^2} \underline{u_s}$$

$$\Rightarrow \frac{1}{RC} \frac{d\underline{u_e}}{dt} = \frac{3}{RC} \frac{d\underline{u_s}}{dt} + \frac{d^2 \underline{u_s}}{dt^2} + \frac{1}{(RC)^2} \underline{u_s}$$

$$\text{si } \underline{u_e} = t = \text{cte alors } \frac{d\underline{u_e}}{dt} = 0 \Rightarrow \frac{d^2 \underline{u_s}}{dt^2} + \frac{3}{RC} \frac{d\underline{u_s}}{dt} + \frac{1}{(RC)^2} \underline{u_s} = 0$$

Exercice 4

$$1) \underline{H}(j\omega) = \frac{1}{1 + j\frac{\omega}{\omega_0}} \quad \text{Filtre passe-bas d'ordre 1.}$$



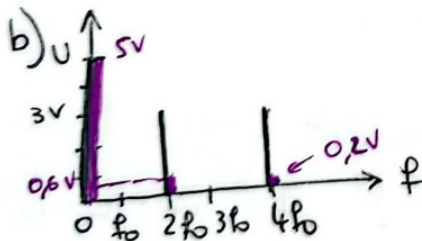
3) intérêt d'un suiveur : impédance d'entrée ∞ et de sortie ≈ 0
 → les intensités de sortie du 1er filtre et d'entrée du 2^d peuvent être $\neq$

$$4) \underline{H} = \frac{\underline{u_3}}{\underline{u_1}} = \frac{\underline{u_3}}{\underline{u_2}} \times \frac{\underline{u_2}}{\underline{u_1}} = \underline{H_2} \times \underline{H_1} = \frac{1}{(1 + j\frac{\omega}{\omega_0})^2}$$

$$5) a) \underline{u_1}(t) = U + \underline{U_{em}} \times \frac{1}{2} (\cos(4\omega_0 t) + \cos(-2\omega_0 t))$$

or $\cos(-x) = \cos(x)$ car $\cos()$ est paire

$$\text{donc } \underline{u_1}(t) = U + \frac{\underline{U_{em}}}{2} \cos(2\omega_0 t) + \frac{\underline{U_{em}}}{2} \cos(4\omega_0 t)$$



$$f_0 = \frac{2\pi}{\omega_0}$$

$$G(\omega) = |\underline{H}| = \frac{1}{1 + (\frac{\omega}{\omega_0})^2}$$

$$c) \underline{u_3}(t) = \underbrace{G(0) \times U}_{U=5V} + \underbrace{G(2\omega_0) \times \frac{\underline{U_{em}}}{2}}_{\frac{\underline{U_{em}}}{10} = 0,6V} \cos(2\omega_0 t + \varphi_2) + \underbrace{G(4\omega_0) \times \frac{\underline{U_{em}}}{2}}_{\frac{\underline{U_{em}}}{34} = 0,18V} \cos(4\omega_0 t + \varphi_4)$$

cf spectre ci-dessus en violet.