

SÈRIE 4

Exercici 1

Q1 b Q2 c Q3 d Q4 c Q5 b

Exercici 2

$$a) \begin{cases} U_2 = R_2 I_2 + R_3(I_1 + I_2) \\ U_1 = R_1 I_1 + R_3(I_1 + I_2) \end{cases}; \begin{cases} 50 = 20 \cdot I_2 + 30(I_1 + I_2) \\ 40 = I_1 + 30(I_1 + I_2) \end{cases} \Rightarrow \begin{cases} I_1 = 0,7692 \\ I_2 = 0,5384 \end{cases}$$

$$A_1 = I_1 = 0,7692 \text{ A}$$

$$b) P_1 = U_1 I_1 = 40 \cdot 0,7692 = 30,77 \text{ W}; \quad P_2 = U_2 I_2 = 50 \cdot 0,5384 = 26,92 \text{ W}$$

$$c) A_1 = 0 \Rightarrow \begin{cases} I_2 = \frac{U_2}{R_2 + R_3} \\ U_1' = R_3 I_2 \end{cases}; \quad U_1' = 30 \frac{50}{20 + 30} = 30 \text{ V}$$

OPCIÓ A

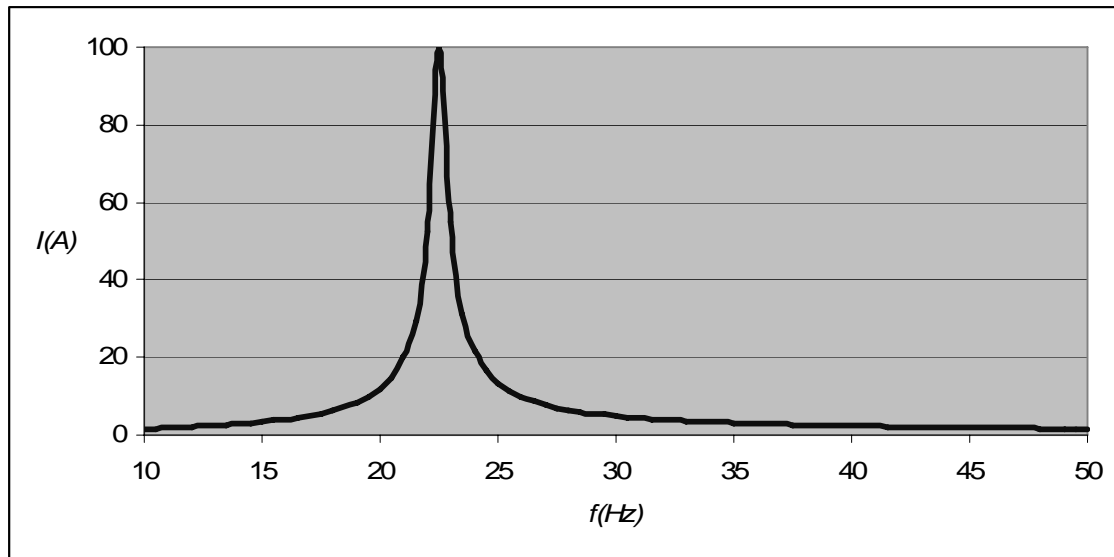
Exercici 3

$$a) X_L = \omega L; \quad X_C = \frac{1}{\omega \cdot C}; \quad Z = \sqrt{R^2 + (X_L^2 - X_C^2)}; \quad I = \frac{U}{Z}$$

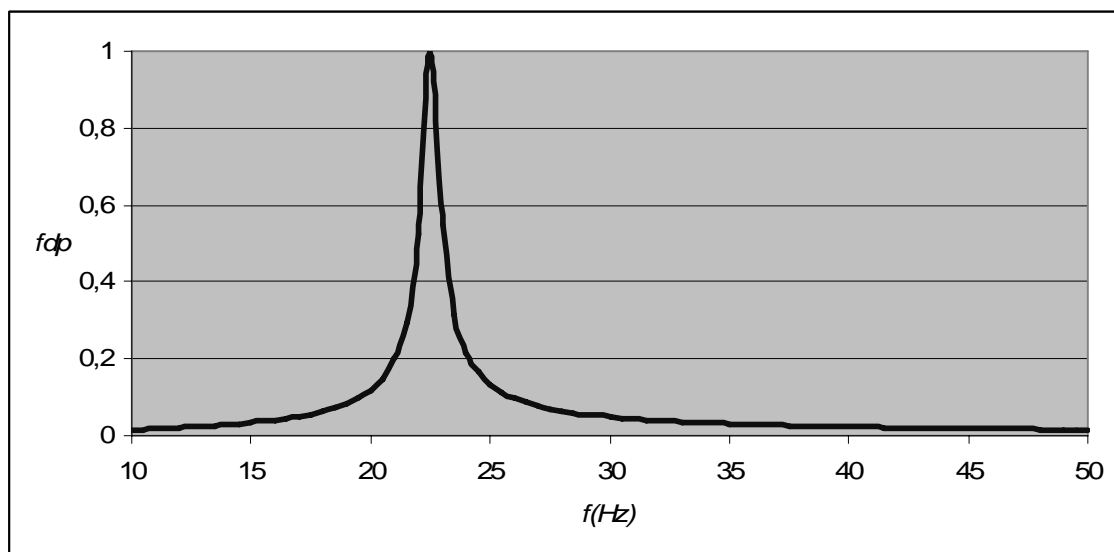
$$I_{\max} \Rightarrow Z_{\min} \Rightarrow X_L = X_C \Rightarrow \begin{cases} \omega = \omega_r = \frac{1}{\sqrt{LC}} \quad (\text{ressonància}) \\ I_{\max} = \frac{U}{R} \end{cases}$$

$$\begin{cases} f_r = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{0,5 \cdot 100 \cdot 10^{-6}}} = 22,51 \text{ Hz} \\ I_{\max} = \frac{U}{R} = \frac{200}{2} = 100 \text{ A} \end{cases}$$

$$I = \frac{200}{\sqrt{2^2 + \left(2\pi f \cdot 0,5 - \frac{1}{2\pi f \cdot 100 \cdot 10^{-6}}\right)^2}} = \frac{200}{\sqrt{4 + \left(\pi f - \frac{5000}{\pi f}\right)^2}}$$



$$b) \text{ fdp} = \cos \varphi = \frac{R}{\sqrt{R^2 + (X_L^2 - X_C^2)}} = \frac{2}{\sqrt{4 + \left(\pi f - \frac{5000}{\pi f}\right)^2}}; \quad \text{fdp}_{\text{màx}} = 1; \quad f = f_r$$



$$c) P = RI^2 \Rightarrow P_{\text{màx}} = RI_{\text{màx}}^2 = 2 \cdot 100^2 = 20 \text{ kW}; \quad f = f_r = 22,51 \text{ Hz}$$

Exercici 4

$$a) \eta(\%) = 100 \frac{P}{\sqrt{3}UI \cos \varphi} = 100 \frac{7.500}{\sqrt{3}400 \cdot 15 \cdot 0,82} = 88,01\%$$

b) $p = 2$ parells de pols

$$c) \Gamma = \frac{P}{\omega} = \frac{7500}{1450 \frac{2\pi}{60}} = 49,39 \text{ Nm}$$

d) Estrella, $I_{\text{línia}} = 15 \text{ A}$

OPCIÓ B

Exercici 3

$$a) I_R = \frac{U}{R} = \frac{230}{10} = 23 \text{ A}; \quad I_X = \frac{U}{X_L} = \frac{230}{10} = 23 \text{ A}; \quad I_L = \sqrt{3} \sqrt{I_R^2 + I_X^2} = \sqrt{3} \sqrt{23^2 + 23^2} = 56,34 \text{ A}$$

$$b) P = 3 \frac{U^2}{R} = 3 \frac{230^2}{10} = 15,87 \text{ kW}$$

$$c) Q = -3 \frac{U^2}{X_L} = -3 \frac{400^2}{20} = 15,87 \text{ kvar}$$

$$d) \text{fdp} = \cos \varphi = \frac{P}{S} = \frac{P}{\sqrt{P^2 + Q^2}} = \frac{15,87}{\sqrt{15,87^2 + 15,87^2}} = 0,7071 \text{ (i)}$$

Exercici 4

$$a) I = \frac{P}{U} = \frac{264}{12} = 22 \text{ A}; \quad R = \rho \frac{L}{S} = 0,01786 \frac{1}{2,5} = 0,007144 \Omega$$

$$\Delta U(\%) = 100 \frac{2RI}{U} = 100 \frac{2 \cdot 0,007144 \cdot 22}{12} = 2,62\%$$

b) 25 A

$$c) I_{\text{cc}} = \frac{U}{2R} = \frac{12}{2 \cdot 0,007144} = 840 \text{ A}$$