

Sèrie 2

**Primera part**

**Exercici 1**

Q1 c      Q2 c      Q3 d      Q4 c      Q5 c

**Exercici 2**

$$a) \begin{cases} U_1 = R_1 I_1 + R_3(I_1 + I_2) \\ U_2 = R_2 I_2 + R_3(I_1 + I_2) \end{cases} \rightarrow \begin{cases} 100 = 10I_1 + 5(I_1 + I_2) \\ 50 = 10I_2 + 5(I_1 + I_2) \end{cases} \rightarrow \begin{matrix} I_1 = 6,25 \text{ A} \\ I_2 = 1,25 \text{ A} \end{matrix}$$

$$b) P_1 = U_1 I_1 = 625 \text{ W}; P_2 = U_2 I_2 = 62,5 \text{ W}$$

$$c) P_2' = 0 \Rightarrow I_2' = 0 \Rightarrow \begin{cases} (R_3 + R_4) I_1 = U_2 \\ I_1 = \frac{U_1 - U_2}{R_1} \end{cases} \Rightarrow (R_3 + R_4)(U_1 - U_2) = R_1 U_2$$

$$R_4 = \frac{R_1 U_2 - R_3 (U_1 - U_2)}{U_1 - U_2} \qquad R_4 = \frac{10 \cdot 50 - 5 \cdot 50}{50} = 5 \Omega$$

OPCIÓ A

**Exercici 3**

$$a) R = \frac{3U^2}{P} = \frac{3 \cdot 400^2}{10000} = 48 \Omega$$

$$b) X_L = \frac{3U^2}{Q} = \frac{3 \cdot 400^2}{10000} = 48 \Omega; L = \frac{X_L}{\omega} = \frac{48}{100\pi} = 152,8 \text{ mH}$$

$$c) \text{fdp} = \cos \varphi = \frac{P}{S} = \frac{P}{\sqrt{P^2 + Q^2}} = \frac{10}{\sqrt{10^2 + 10^2}} = 0,7071 \text{ (i)}$$

$$d) I_b = \sqrt{I_R^2 + I_L^2} = \sqrt{\left(\frac{U}{R}\right)^2 + \left(\frac{U}{X_L}\right)^2} = U \sqrt{\frac{1}{R^2} + \frac{1}{X_L^2}} = \frac{400}{48} \sqrt{2} = 11,79 \text{ A}$$

$$I_L = \sqrt{3} I_b = 20,41 \text{ A}$$

**Exercici 4**

a)  $U_2 = \frac{U_1}{r_t} = 24 \text{ V}$

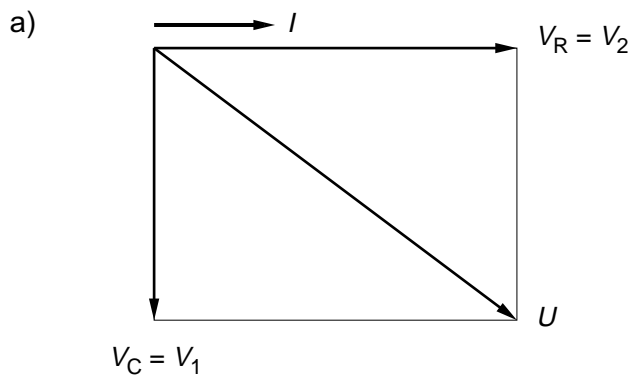
b)  $I_2 = \sqrt{\left(\frac{U_2}{R}\right)^2 + \left(\frac{U_2}{X_L}\right)^2} = U_2 \sqrt{\frac{1}{R^2} + \frac{1}{X_L^2}} = 24\sqrt{2} = 33,94 \text{ A}$

c)  $I_1 = \frac{I_2}{r_t} = 3,394 \text{ A}$

d)  $P = \frac{U_2^2}{R} = 576 \text{ W}$  ;  $Q = \frac{U_2^2}{X_L} = 576 \text{ Var}$  ;  $S = \sqrt{P^2 + Q^2} = 814,6 \text{ VA}$

**OPCIÓ B**

**Exercici 3**

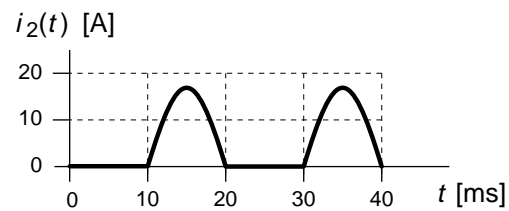
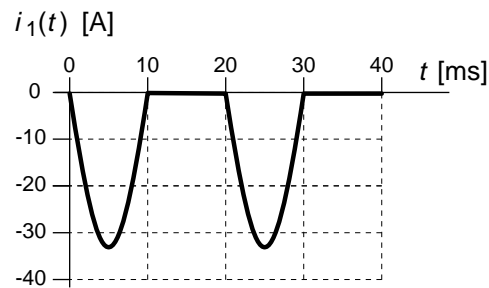
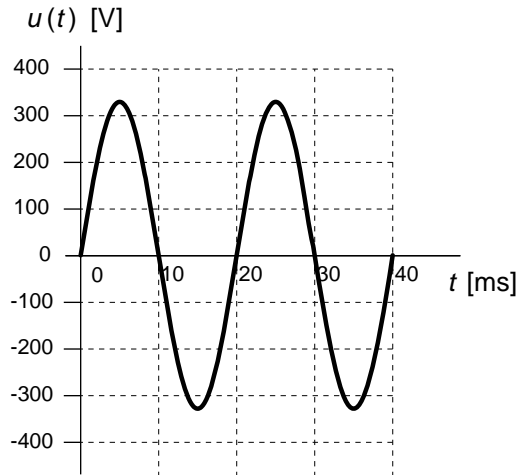


b)  $U = \sqrt{V_1^2 + V_2^2} = \sqrt{115^2 + 115^2} = 162,6 \text{ V}$

c)  $P = V_1 I_1 = 115 \text{ W}$

Exercici 4

a)



$$b) \hat{i}_1 = \frac{\hat{U}}{R_1} = \frac{230\sqrt{2}}{10} = 32,53 \text{ A}; \quad \hat{i}_2 = \frac{\hat{U}}{R_2} = \frac{230\sqrt{2}}{20} = 16,26 \text{ A}$$

$$c) P_1 = \frac{1}{2} R_1 \left( \frac{\hat{i}_1}{\sqrt{2}} \right)^2 = \frac{1}{2} \cdot 10 \cdot 23^2 = 2,645 \text{ kW};$$

$$P_2 = \frac{1}{2} R_2 \left( \frac{\hat{i}_2}{\sqrt{2}} \right)^2 = \frac{1}{2} \cdot 20 \cdot 11,5^2 = 1,323 \text{ kW}$$

**SÈRIE 1**

**Primera part**

**Exercici 1**

Q1 b    Q2 a    Q3 a    Q4 b    Q5 a

**Exercici 2**

$$a) R = \frac{3U^2}{P} = \frac{3 \cdot 400^2}{10000} = 48 \Omega;$$

$$b) X_C = \frac{3U^2}{-Q} = \frac{3 \cdot 400^2}{10000} = 48 \Omega; C = \frac{1}{\omega \cdot X_C} = \frac{1}{100 \cdot \pi \cdot 48} = 66,31 \mu\text{F}$$

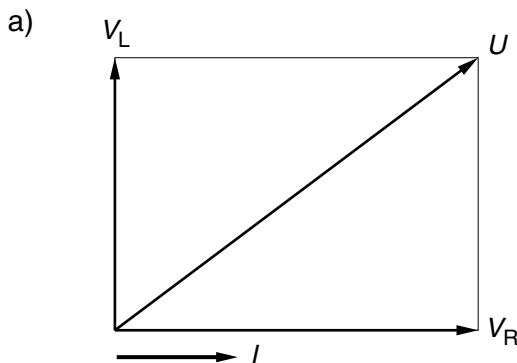
$$c) \text{fdp} = \cos \varphi = \frac{P}{S} = \frac{P}{\sqrt{P^2 + Q^2}} = \frac{10}{\sqrt{10^2 + 10^2}} = 0,7071$$

$$d) I_b = \sqrt{I_R^2 + I_C^2} = \sqrt{\left(\frac{U}{R}\right)^2 + \left(\frac{U}{X_C}\right)^2} = U \sqrt{\frac{1}{R^2} + \frac{1}{X_C^2}} = \frac{400}{48} \sqrt{2} = 11,79 \text{ A}$$

$$I_L = \sqrt{3} I_b = 20,41 \text{ A}$$

**OPCIÓ A**

**Exercici 3**



$$b) X_L = \frac{V_L}{I} = 115 \Omega$$

$$c) V_2 = V_R = \sqrt{U^2 - V_L^2} = \sqrt{230^2 - 115^2} = 199,2 \text{ V}$$

$$d) P = V_R I = 199,2 \text{ W}$$

**Exercici 4**

$$a) \eta(\%) = 100 \frac{P}{\sqrt{3} UI \cos \varphi} = 100 \frac{120000}{\sqrt{3} \cdot 693 \cdot 130 \cdot 0,84} = 91,55\%$$

b)  $p = 2$  parells de pols

$$c) \Gamma = \frac{P}{\omega} = \frac{120000}{1450 \frac{2\pi}{60}} = 790,3 \text{ Nm}$$

d) Triangle,  $I_{\text{línia}} = 225 \text{ A}$

OPCIÓ B

Exercici 3

$$a) -U_1 + (R_1 + R_2 + R_3 + R_4)I + U_2 = 0 \Rightarrow I = \frac{U_1 - U_2}{R_1 + R_2 + R_3 + R_4} = \frac{50}{15} = 3,333 \text{ A}$$

$$b) P_1 = U_1 I = 333,3 \text{ W}; P_2 = -U_2 I = -166,7 \text{ kW}$$

$$c) P_1 = \frac{U_1^2}{R_1 + R_2} = \frac{100^2}{5} = 2 \text{ kW}; P_2 = \frac{U_2^2}{R_3 + R_4} = \frac{50^2}{10} = 250 \text{ W}$$

Exercici 4

$$a) I = \frac{P}{U} = \frac{10000}{230} = 43,48 \text{ A}$$

$$\Delta U_{\text{màx}} = 2R_{\text{màx}}I \Rightarrow R_{\text{màx}} = \frac{\Delta U_{\text{màx}}}{2I} = \frac{0,05 \cdot 230}{2 \cdot 43,48} = 0,1323 \Omega$$

$$R_{\text{màx}} = \rho \frac{L}{S_{\text{mín}}} \Rightarrow S_{\text{mín}} = \rho \frac{L}{R_{\text{màx}}} = 0,01786 \frac{100}{0,1323} = 13,5 \text{ mm}^2$$

$$b) S = 16 \text{ mm}^2$$

$$c) \Delta U = \Delta U_{\text{màx}} \frac{S_{\text{mín}}}{S} = 5 \frac{13,5}{16} = 4,22\%$$