

SÈRIE 1**Primera part****Exercici 1**

Q1 d **Q2** a **Q3** c **Q4** c **Q5** b

Exercici 2

$$a) A_1 = \frac{U}{R_1} = \frac{400}{\frac{280}{\sqrt{3}}} = 0,825 \text{ A}$$

$$b) R_2 = \frac{U}{A_2} = \frac{400}{\frac{1,2}{\sqrt{3}}} = 192,45 \Omega$$

$$c) A_3 = A_1 + A_2 = 0,825 + 1,2 = 2,025 \text{ A}$$

$$d) Q = 0 \text{ var}; S = \sqrt{3} \cdot U \cdot I = \sqrt{3} \cdot 400 \cdot 2,025 = 1,4 \text{ kVA}; P = 1,4 \text{ kW}$$

OPCIÓ A**Exercici 3**

$$a) P = \sqrt{3} U I \cos \varphi = \sqrt{3} \cdot 690 \cdot 18,88 \cdot 0,79 = 17,83 \text{ kW}$$

$$Q = \sqrt{3} U I \sin \varphi = \sqrt{3} \cdot 690 \cdot 18,88 \cdot \sqrt{1 - 0,79^2} = 13,83 \text{ kvar}$$

$$S = \sqrt{3} U I = \sqrt{3} \cdot 690 \cdot 18,88 = 22,56 \text{ kVA}$$

Alternativament,

$$P = \sqrt{3} U I \cos \varphi = \sqrt{3} \cdot 400 \cdot 32,7 \cdot 0,79 = 17,9 \text{ kW}$$

$$Q = \sqrt{3} U I \sin \varphi = \sqrt{3} \cdot 400 \cdot 32,7 \cdot \sqrt{1 - 0,79^2} = 13,89 \text{ kvar}$$

$$S = \sqrt{3} U I = \sqrt{3} \cdot 400 \cdot 32,7 = 22,66 \text{ kVA}$$

$$b) p = 4$$

$$c) \Gamma = \frac{P}{\omega} = \frac{15000}{732 \frac{2\pi}{60}} = 195,68 \text{ Nm}$$

$$d) 400 \text{ V}, I_{\text{Línia}} = 32,7 \text{ A}$$

Exercici 4

$$a) \begin{cases} R_1 I_1 + R_2 (I_1 + I_2) = U_1 \\ R_3 I_2 + R_2 (I_1 + I_2) = U_2 \end{cases} \rightarrow \begin{cases} (R_1 + R_2) I_1 + R_2 I_2 = U_1 \\ R_2 I_1 + (R_2 + R_3) I_2 = U_2 \end{cases}$$

$$\begin{cases} (10 + 20) I_1 + 20 I_2 = 48 \\ 20 I_1 + (20 + 10) I_2 = 36 \end{cases} \rightarrow \begin{cases} 30 I_1 + 20 I_2 = 48 \\ 20 I_1 + 30 I_2 = 36 \end{cases} \rightarrow \begin{cases} I_1 = 1,44 \text{ A} \\ I_2 = 0,24 \text{ A} \end{cases}$$

$$b) P(R_2) = R_2 (I_1 + I_2)^2 = 20(1,44 + 0,24)^2 = 56,448 \text{ W}$$

$$c) I_1 = \frac{U_1}{R_1} = \frac{48}{10} = 4,8 \text{ A}; I_2 = \frac{U_2}{R_3} = \frac{36}{10} = 3,6 \text{ A}$$

OPCIÓ B

Exercici 3

$$a) A_1 = \frac{V_1}{R} = \frac{230}{115} = 2 \text{ A}$$

$$b) X_L = \omega L = 2\pi fL = 2\pi 150 \cdot 3 \cdot 10^{-3} = 2,8274 \Omega$$

$$X_{C1} = \frac{1}{\omega C_1} = \frac{1}{2\pi f C_1} = \frac{1}{2\pi 150 \cdot 250 \cdot 10^{-6}} = 4,2441 \Omega$$

$$A_2 = I_L - I_{C1} = \frac{V_1}{X_L} - \frac{V_1}{X_{C1}} = \frac{230}{2,8274} - \frac{230}{4,2441} = 27,1539 \text{ A}$$

$$c) A_3 = \sqrt{A_1^2 + A_2^2} = \sqrt{2^2 + 27,1539^2} = 27,2275 \text{ A}$$

$$d) A_3 = A_1 \rightarrow A_2 = 0 = (I_L - I_{C1}) - I_{C2} \rightarrow I_{C2} = (I_L - I_{C1}) = 27,1539 \text{ A}$$

$$I_{C2} = 27,1539 = \frac{V_1}{X_{C2}} = \frac{230}{X_{C2}} \rightarrow X_{C2} = \frac{230}{27,1539} = 8,4702 \Omega$$

$$C_2 = \frac{1}{\omega X_{C2}} = \frac{1}{2\pi 150 \cdot 8,4702} = 125,27 \mu\text{F}$$

També es pot fer: $f_r = \frac{1}{2\pi\sqrt{LC}} \rightarrow C = \frac{1}{(2\pi f_r)^2 L} = \frac{1}{(2\pi 150)^2 \cdot 3 \cdot 10^{-3}} = 375,26 \mu\text{F}$

$$C = C_1 + C_2 \rightarrow C_2 = C - C_1 = 375,26 - 250 = 125,26 \mu\text{F}$$

Exercici 4

$$a) \Delta U_{\text{màx}} = 230 \frac{3}{100} = 6,9 \text{ V} \quad R_{\text{escalfador}} = \frac{U_N^2}{P_N} = \frac{230^2}{1800} = 29,39 \Omega$$

$$U = 230 = \Delta U_{\text{màx}} + R_{\text{escalfador}} \cdot I = 6,9 + 29,39 \cdot I \rightarrow I = 7,591 \text{ A}$$

$$\Delta U_{\text{màx}} = 2 \cdot R_{\text{conductor}} \cdot I \rightarrow R_{\text{conductor}} = \frac{\Delta U_{\text{màx}}}{2 \cdot I} = \frac{6,9}{2 \cdot 7,591} = 0,4545 \Omega$$

$$R_{\text{conductor}} = \rho \frac{l}{S_{\text{mínima}}} \rightarrow S_{\text{mínima}} = \rho \frac{l}{R_{\text{conductor}}} = 16,8 \cdot 10^{-9} \frac{50}{0,4545} = 1,85 \text{ mm}^2$$

S'escull, doncs, la secció dels conductors de 2,5 mm².

$$b) R_c = \rho \frac{l}{S} = 16,8 \cdot 10^{-9} \frac{50}{2,5 \cdot 10^{-6}} = 0,336 \Omega$$

$$I = \frac{U_N}{2 \cdot R_c + R_{\text{escalfador}}} = \frac{230}{2 \cdot 0,336 + 29,39} = 7,65 \text{ A}$$

$$P_{\text{escalfador}} = R_{\text{escalfador}} \cdot I^2 = 29,39 \cdot 7,65^2 = 1720 \text{ W}$$

$$c) I_{cc} = \frac{U_N}{2 \cdot R_c} = \frac{230}{2 \cdot 0,336} = 342,3 \text{ A}$$