SÈRIE 1

Primera part

Exercici 1

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

Exercici 2

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

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

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 V, $I_{\text{Línia}}$ = 32,7 A

Exercici 4

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

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

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) $X_\text{L} = \omega L = 2\pi f L = 2\pi 150 \cdot 3 \cdot 10^{-3} = 2{,}8274\ \Omega$

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

$A_2 = I_\text{L} - I_{\text{C}1} = \frac{V_1}{X_\text{L}} - \frac{V_1}{X_{\text{C}1}} = \frac{230}{2{,}8274} - \frac{230}{4{,}2441} = 27{,}1539\ \text{A}$

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

d) $A_3 = A_1 \ \rightarrow \ A_2 = 0 = (I_\text{L} - I_{\text{C}1}) - I_{\text{C}2} \ \rightarrow \ I_{\text{C}2} = (I_\text{L} - I_{\text{C}1}) = 27{,}1539\ \text{A}$

$I_{\text{C}2} = 27{,}1539 = \frac{V_1}{X_{\text{C}2}} = \frac{230}{X_{\text{C}2}} \ \rightarrow \ X_{\text{C}2} = \frac{230}{27{,}1539} = 8{,}4702\ \Omega$

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

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

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

Exercici 4

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

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

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

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

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

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

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

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

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