Sèrie 4

Primera part

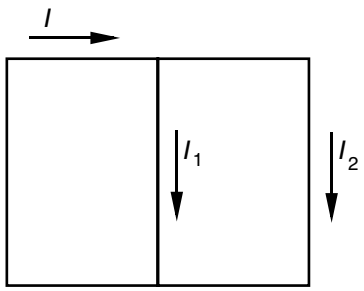
Exercici 1

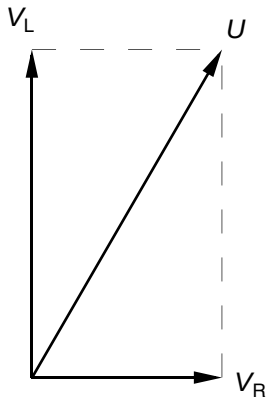
Q1 a **Q2** d **Q3** c **Q4** b **Q5** c

Exercici 2

a) $P = RI^2 \Rightarrow I = \sqrt{\frac{P}{R}} = \sqrt{\frac{250}{10}} = 5 \text{ A}$

b)





$V_R = RI = 10 \cdot 5 = 50 \text{ V}$

$V_L = \sqrt{U^2 - V_R^2} = \sqrt{100^2 - 50^2} = 86{,}6 \text{ V}$

c) $X_1 = \frac{V_L}{I_1} = \frac{86{,}6}{2} = 43{,}3 \ \Omega$

$L_1 = \frac{X_1}{\omega} = \frac{X_1}{2 \cdot \pi \cdot f} = \frac{43{,}3}{2 \cdot \pi \cdot 50} = 137{,}8 \text{ mH}$

Segona part

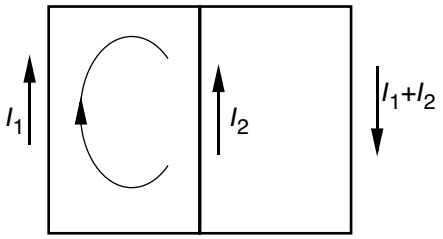
OPCIÓ A

Exercici 3

a) $R_{34} = R_3 + R_4 = 4 + 6 = 10\ \Omega$

$$\frac{1}{R_{234}} = \frac{1}{R_{34}} + \frac{1}{R_2} \Rightarrow R_{234} = \frac{R_{34}R_2}{R_{34} + R_2} = \frac{10 \cdot 10}{10 + 10} = 5\ \Omega$$

b)



$$-U_1 + R_1 I_1 + U_2 = 0 \Rightarrow I_1 = \frac{U_1 - U_2}{R_1} = \frac{60 - 40}{5} = 4\ \text{A}$$

$$I_1 + I_2 = \frac{U_2}{R_{234}} = \frac{40}{5} = 8\ \text{A}$$

$$I_2 = (I_1 + I_2) - I_1 = 8 - 4 = 4\ \text{A}$$

c) $P_1 = U_1 I_1 = 60 \cdot 4 = 240\ \text{W}$

$P_2 = U_2 I_2 = 40 \cdot 4 = 160\ \text{W}$

$P_{\text{tot}} = P_1 + P_2 = 240 + 160 = 400\ \text{W}$

Exercici 4

a) $k = \frac{E}{n} = \frac{250}{1500} = 0{,}1667\ \frac{\text{V}}{\text{min}^{-1}}$

b) $E' = U - R_i I = 200 - 1{,}2 \cdot 10 = 188\ \text{V}$

$n' = \frac{E'}{k} = \frac{188}{0{,}1667} = 1128\ \text{min}^{-1}$

c) $P_{\text{pèrdues}} = R_i I^2 = 1{,}2 \cdot 10^2 = 120\ \text{W}$

$P_{\text{elèctrica}} = UI = 200 \cdot 10 = 2000\ \text{W}$

$P_{\text{útil}} = P_{\text{elèctrica}} - P_{\text{pèrdues}} = 2000 - 120 = 1880\ \text{W}$

$\eta(\%) = 100 \frac{P_{\text{útil}}}{P_{\text{elèctrica}}} = 100 \frac{1880}{2000} = 94\ \%$

OPCIÓ B

Exercici 3

a) $Z = \sqrt{R^2 + X^2} = \sqrt{10^2 + 10^2} = 14{,}14\ \ \Omega$

$I_b = \dfrac{U}{Z} = \dfrac{400}{14{,}14} = 28{,}28$ A

$I_l = \sqrt{3} I_b = \sqrt{3} \cdot 28{,}28 = 48{,}99$ A

b) $fdp = \cos\varphi = \dfrac{R}{Z} = \dfrac{10}{14{,}14} = 0{,}707$

c) $S = \sqrt{3} \cdot U \cdot I_l = \sqrt{3} \cdot 400 \cdot 48{,}99 = 33{,}94$ kVA

$P = S \cdot \cos\varphi = 33{,}94 \cdot 10^3 \cdot 0{,}707 = 24$ kW

$Q = S \cdot \sin\varphi = 33{,}94 \cdot 10^3 \cdot \sqrt{1 - 0{,}707^2} = 24$ kVAr

Exercici 4

a) $R_2 = \dfrac{V_{23}}{I_2} = 30\ \ \Omega$

b) $I_3 = I_1 - I_2 = 6$ A ; $R_3 = \dfrac{V_{23}}{I_3} = 20\ \ \Omega$

c) $R_1 = \dfrac{U - V_{23}}{I_1} = 8\ \ \Omega$

d) $I_4 = \dfrac{U}{R_4} = 20$ A ; $I = I_4 + I_1 = 30$ A

e) $P = U \cdot I = 200 \cdot 30 = 6000$ W