

SÈRIE 5

Primera part

Exercici 1

Q1 d Q2 a Q3 c Q4 d Q5 c

Exercici 2

a) $I_1 = \frac{P_{U_1}}{U_1} = \frac{60}{24} = 2,5 \text{ A}$

b)

$$\begin{cases} R_1 I_1 + R_3 (I_1 - I_2) = U_1 \\ R_3 (I_1 - I_2) - R_2 I_2 = U_2 \end{cases} \rightarrow \begin{cases} 5 \cdot 2,5 + R_3 (2,5 - I_2) = 24 \\ R_3 (2,5 - I_2) - 7 I_2 = 10,1 \end{cases} \rightarrow$$

$$\begin{cases} 2,5 R_3 - R_3 I_2 = 11,5 \\ 2,5 R_3 - R_3 I_2 - 7 I_2 = 10,1 \end{cases} \rightarrow \begin{cases} I_2 = \frac{2,5 R_3 - 11,5}{R_3} \\ 2,5 R_3 - R_3 \frac{2,5 R_3 - 11,5}{R_3} - 7 \frac{2,5 R_3 - 11,5}{R_3} = 10,1 \end{cases}$$

$$\begin{cases} I_2 = \frac{2,5 R_3 - 11,5}{R_3} \\ 11,5 - 7 \frac{2,5 R_3 - 11,5}{R_3} = 10,1 \end{cases} \rightarrow \begin{cases} I_2 = \frac{2,5 R_3 - 11,5}{R_3} \\ \frac{2,5 R_3 - 11,5}{R_3} = 0,2 \end{cases} \rightarrow \begin{cases} I_2 = 0,2 \text{ A} \\ R_3 = 5 \Omega \end{cases}$$

OPCIÓ A

Exercici 3

a) $A_1 = \frac{U}{\sqrt{R^2 + X_L^2}} = \frac{400}{\sqrt{50^2 + 100^2}} = 3,578 \text{ A}$

b) $A_2 = \sqrt{3} A_1 = \sqrt{3} \cdot 3,578 = 6,197 \text{ A}$

c) $V_1 = R A_1 = 50 \cdot 3,578 = 178,9 \text{ V}$

d) $V_2 = X_L A_1 = 100 \cdot 3,578 = 357,8 \text{ V}$

e) $P = 3 R A_1^2 = 3 \cdot 50 \cdot 3,578^2 = 1920 \text{ W}$

Exercici 4

a) Escala de tensió = $\frac{U_{G1 \text{ màx}}}{\text{Núm.Div}} = \frac{36}{3,6} = 10 \frac{\text{V}}{\text{div}}$

b) $f = \frac{1}{T} = \frac{1}{6 \text{ div} \cdot 2 \frac{\mu\text{s}}{\text{div}}} = 83,33 \text{ kHz}$

c) Semiperíode positiu: $P_p = \frac{U_{G1}^2}{R_{\text{Eq}}} = \frac{U_{G1}^2}{R_1 + \frac{R_2 R_3}{R_2 + R_3}} = \frac{36^2}{10 + \frac{10 \cdot 10}{10 + 10}} = 86,4 \text{ W}$

Semiperíode negatiu: $P_n = 0 \text{ W}$

Potència mitja: $P = \frac{P_p + P_n}{2} = \frac{86,4 + 0}{2} = 43,2 \text{ W}$

OPCIÓ B

Exercici 3

$$a) \eta(\%) = 100 \frac{P_N}{P} = 100 \frac{110000}{\sqrt{3} \cdot 690 \cdot 120 \cdot 0,84} = 91,31 \%$$

Alternativament,

$$\eta(\%) = 100 \frac{P_N}{P} = 100 \frac{110000}{\sqrt{3} \cdot 400 \cdot 208 \cdot 0,84} = 90,87 \%$$

$$b) \Gamma = \frac{P_N}{\omega_N} = \frac{110000}{1450 \frac{2\pi}{60}} = 724,4 \text{ N m}$$

$$c) Q = \sqrt{3} U_N I_N \sin \varphi_N = \sqrt{3} \cdot 690 \cdot 120 \cdot \sqrt{1 - 0,84^2} = 77,81 \text{ kvar}$$

Alternativament,

$$Q = \sqrt{3} U_N I_N \sin \varphi_N = \sqrt{3} \cdot 400 \cdot 208 \cdot \sqrt{1 - 0,84^2} = 78,19 \text{ kvar}$$

$$d) 400 \text{ V}$$

$$e) 208 \text{ A}$$

Exercici 4

a)

$$\begin{cases} R_2 I_2 = R_3 I_3 \\ R_2 I_2^2 + R_3 I_3^2 = W \end{cases} \rightarrow \begin{cases} I_2 = \frac{R_3 I_3}{R_2} \\ R_2 \left(\frac{R_3 I_3}{R_2}\right)^2 + R_3 I_3^2 = W \end{cases} \rightarrow \begin{cases} I_2 = \frac{R_3 I_3}{R_2} \\ \frac{(R_3 I_3)^2}{R_2} + R_3 I_3^2 = W \end{cases}$$

$$\begin{cases} I_2 = \frac{2 \cdot I_3}{3} \\ \frac{(2 \cdot I_3)^2}{3} + 2 I_3^2 = 187,5 \end{cases} \rightarrow \begin{cases} I_2 = \frac{2 \cdot I_3}{3} = \frac{2 \cdot 7,5}{3} = 5 \text{ A} \\ I_3 = \sqrt{\frac{187,5 \cdot 3}{10}} = 7,5 \text{ A} \end{cases}$$

Alternativament:

$$R_{\text{Eq},2,3} = \frac{R_2 R_3}{R_2 + R_3} = \frac{3 \cdot 2}{3 + 2} = 1,2 \Omega \quad U_{\text{Eq},2,3} = \sqrt{W R_{\text{Eq},2,3}} = \sqrt{187,5 \cdot 1,2} = 15 \text{ V}$$

$$I_2 = \frac{U_{\text{Eq},2,3}}{R_2} = \frac{15}{3} = 5 \text{ A} \quad I_3 = \frac{U_{\text{Eq},2,3}}{R_3} = \frac{15}{2} = 7,5 \text{ A}$$

$$b) A_1 = I_2 + I_3 = 5 + 7,5 = 12,5 \text{ A}$$

c)

$$Z = \frac{U}{A_1} = \frac{100}{12,5} = 8 \Omega \quad Z = \sqrt{(R_1 + R_{\text{Eq},2,3})^2 + X_L^2}$$

$$X_L = \sqrt{Z^2 - (R_1 + R_{\text{Eq},2,3})^2} = \sqrt{8^2 - (5 + 1,2)^2} = 5,056 \Omega$$

$$L = \frac{X_L}{2 \pi f} = \frac{5,06}{2 \pi 50} = 16,09 \text{ mH}$$