SÈRIE 5

Primera part

Exercici 1

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

Exercici 2

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

$$\begin{bmatrix} R_1+R_3 & R_1 \\ R_1 & R_1+R_2 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \end{bmatrix}=\begin{bmatrix} U_1 \\ U_2 \end{bmatrix} \rightarrow \begin{bmatrix} 10+30 & 10 \\ 10 & 10+20 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \end{bmatrix}=\begin{bmatrix} 48 \\ 36 \end{bmatrix}$$

$$\begin{bmatrix} 40 & 10 \\ 10 & 30 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \end{bmatrix}=\begin{bmatrix} 48 \\ 36 \end{bmatrix} \rightarrow \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}=\begin{bmatrix} 0{,}982 \\ 0{,}873 \end{bmatrix}\text{ A}$$

b) $P_{\text{Total}}=U_1\,I_1+U_2\,I_2=48\cdot 0{,}982+36\cdot 0{,}873=78{,}56\text{ W}$

Alternativament,

$$P_{\text{Total}}=R_1\,(I_1+I_2)^2+R_2\,I_2^2+R_3\,I_1^2$$

$$P_{\text{Total}}=10\cdot(0{,}982+0{,}873)^2+20\cdot 0{,}873^2+30\cdot 0{,}982^2=78{,}58\text{ W}$$

c) $P_{R_2}=\frac{U_{R_2}^2}{R_2}=\frac{48^2}{20}=115{,}2\text{ W}$

d) $P_{R_3}=\frac{U_{R_3}^2}{R_3}=\frac{36^2}{30}=43{,}2\text{ W}$

Segona part

OPCIÓ A

Exercici 3

a) $V_1=\frac{U}{\sqrt{3}}=\frac{100}{\sqrt{3}}=57{,}735\text{ V}$

b) $X_{\text{L}}=X_{\text{C}}=\frac{V_1}{A_2}=\frac{57{,}735}{2{,}721}=21{,}218\,\Omega$

$$C=\frac{1}{\omega\,X_{\text{C}}}=\frac{1}{2\,\pi\,f\,X_{\text{C}}}=\frac{1}{2\,\pi\,75\cdot 21{,}218}=100\,\mu\text{F}$$

$$L=\frac{X_{\text{L}}}{\omega}=\frac{X_{\text{L}}}{2\,\pi\,f}=\frac{21{,}218}{2\,\pi\,75}=45{,}03\text{ mH}$$

c) $A_3=A_2=2{,}721\text{ A}$

d) $A_1=0\text{ A}$

e) $A_4=0\text{ A}$

Exercici 4

a) $f = \frac{1}{T} = \frac{1}{5\ \text{div} \cdot 10\ \frac{\mu\text{s}}{\text{div}} \cdot \frac{1\ \text{s}}{10^6\ \mu\text{s}}} = 20\ \text{kHz}$

b) Quan condueix D_1:

$U_{R_1} = 4\ \text{div} \cdot\ 0{,}5\ \frac{\text{V}}{\text{div}} = 2\ \text{V} \quad \rightarrow \quad I_{R_1} = I_{R_3} = \frac{U_{R_1}}{R_1} = \frac{2}{5} = 0{,}4\ \text{A}$

$U_{G_1\,\text{Màx}} = (R_1 + R_3)\ I_{R_1} = (5 + 15)\ 0{,}4 = 8\ \text{V}$

Quan condueix D_2:

$U_{R_1} = -4\ \text{div} \cdot\ 0{,}5\ \frac{\text{V}}{\text{div}} = -2\ \text{V} \quad \rightarrow \quad I_{R_1} = I_{R_2} = \frac{U_{R_1}}{R_1} = \frac{-2}{5} = -0{,}4\ \text{A}$

$U_{G_1\,\text{Mín}} = (R_1 + R_2)\ I_{R_1} = (5 + 5)\ (-0{,}4) = -4\ \text{V}$

c) $\overline{U_{G_1}} = \frac{1}{5\ \text{div}} \left(3\ \text{div} \cdot 8\ \text{V} + 2\ \text{div} \cdot (-4\ \text{V})\right) = 3{,}2\ \text{V}$

OPCIÓ B

Exercici 3

a) $P = \sqrt{3}\ U_\text{N}\ I_\text{N}\ \cos\varphi_\text{N} = \sqrt{3} \cdot 690 \cdot 139 \cdot 0{,}85 = 141{,}2\ \text{kW}$

$Q = \sqrt{3}\ U_\text{N}\ I_\text{N} \sin\varphi_\text{N} = \sqrt{3} \cdot 690 \cdot 139 \cdot \sqrt{1 - 0{,}85^2} = 87{,}51\ \text{kvar}$

Alternativament,

$P = \sqrt{3}\ U_\text{N}\ I_\text{N}\ \cos\varphi_\text{N} = \sqrt{3} \cdot 400 \cdot 241 \cdot 0{,}85 = 141{,}9\ \text{kvar}$

$Q = \sqrt{3}\ U_\text{N}\ I_\text{N} \sin\varphi_\text{N} = \sqrt{3} \cdot 400 \cdot 241 \cdot \sqrt{1 - 0{,}85^2} = 87{,}96\ \text{kvar}$

b) $\Gamma = \frac{P_\text{N}}{\omega_\text{N}} = \frac{132000}{985\ \frac{2\,\pi}{60}} = 1{,}28\ \text{kN m}$

c) $\eta(\%) = 100\ \frac{P_\text{N}}{P} = 100\ \frac{132000}{141200} = 93{,}48\ \%$

Alternativament,

$\eta(\%) = 100\ \frac{P_\text{N}}{P} = 100\ \frac{132000}{141900} = 93{,}02\ \%$

d) $p = 3$

e) $U_\text{xarxa} = 400\ \text{V}$ i $I_\text{N} = 241\ \text{A}$

Exercici 4

a) $W_3 = \frac{U_{R_3}^2}{R_3} \quad \rightarrow \quad U_{R_3} = \sqrt{W_3\, R_3} = \sqrt{67{,}5 \cdot 30} = 45\ \text{V}$

$W_2 = \frac{U_{R_3}^2}{R_2} + W_3 = \frac{45^2}{25} + 67{,}5 = 148{,}5\ \text{W}$

b) $I_\text{L} = \frac{U_{R_3}}{X_\text{L}} = \frac{45}{10} = 4{,}5\ \text{A}$

$L = \frac{X_\text{L}}{\omega} = \frac{X_\text{L}}{2\,\pi\, f} = \frac{10}{2\,\pi\, 50} = 31{,}83\ \text{mH}$

c) $I_{R_1} = \sqrt{I_\text{L}^2 + \left(I_{R_2} + I_{R_3}\right)^2} = \sqrt{I_\text{L}^2 + \left(\frac{U_{R_3}}{R_2} + \frac{U_{R_3}}{R_3}\right)^2} = \sqrt{4{,}5^2 + \left(\frac{45}{25} + \frac{45}{30}\right)^2} = 5{,}58\ \text{A}$

$W_1 = R_1\, I_{R_1}^2 + W_2 = 10 \cdot 5{,}58^2 + 148{,}5 = 459{,}86\ \text{W}$