Sèrie 6

Primera part

Exercici 1

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

Exercici 2

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

$I_l = \dfrac{\dfrac{U}{\sqrt{3}}}{Z} = \dfrac{\dfrac{400}{\sqrt{3}}}{14{,}14} = 16{,}33\ \text{A}$

$\dot{I}_N = \dot{I}_1 + \dot{I}_2 + \dot{I}_3 = 0$ per ser simètric el consum

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

$S = \sqrt{3} \cdot U \cdot I_l = \sqrt{3} \cdot 400 \cdot 16{,}33 = 11{,}31\,\text{kVA}$

$P = S \cdot \cos\varphi = 11{,}31 \cdot 10^3 \cdot 0{,}707 = 8\ \text{kW}$

$Q = S \cdot \sin\varphi = 11{,}31 \cdot 10^3 \cdot \sqrt{1 - 0{,}707^2} = 8\ \text{kVAr}$

c) $V(X) = X \cdot I_L = 10 \cdot 16{,}33 = 163{,}3\ \text{V}$

Segona part

OPCIÓ A

Exercici 3

a) $P = RI^2 \Rightarrow R = \dfrac{P}{I^2} = \dfrac{500}{5^2} = 20\ \Omega$

b) $Z_{50} = \dfrac{U_{50}}{I_{50}} = \dfrac{100}{5} = 20\ \Omega$

$Z_{100} = \dfrac{U_{100}}{I_{100}} = \dfrac{256}{5} = 51{,}2\ \Omega$

$Z_{50} = \sqrt{R^2 + X_{50}^2} \Rightarrow X_{50} = \pm\sqrt{Z_{50}^2 - R^2} = \pm\sqrt{20^2 - 20^2} = 0\ \Omega$

$Z_{100} = \sqrt{R^2 + X_{100}^2} \Rightarrow X_{100} = \pm\sqrt{Z_{100}^2 - R^2} = \pm\sqrt{51{,}2^2 - 20^2} = \pm 47{,}13\ \Omega$

Com que a 50 Hz la impedància és mínima (ressonància), a 100 Hz la reactància serà forçosament inductiva $X_{100} = +47{,}13\ \Omega$

c)

$$\left.\begin{array}{l} X_{50} = 2\cdot 50\cdot \pi\cdot L - \dfrac{1}{2\cdot 50\cdot \pi\cdot C} = 0 \\ X_{100} = 2\cdot 100\cdot \pi\cdot L - \dfrac{1}{2\cdot 100\cdot \pi\cdot C} = 47{,}13 \end{array}\right\} \Rightarrow \left\{\begin{array}{l} 2\cdot 50\cdot \pi\cdot L = \dfrac{1}{2\cdot 50\cdot \pi\cdot C} \\ 2\cdot 100\cdot \pi\cdot L - 50\cdot \pi\cdot L = 47{,}13 \end{array}\right\} \Rightarrow$$

$$\left\{\begin{array}{l} L = 100\ \text{mH} \\ C = 101{,}3\ \mu\text{F} \end{array}\right\}$$

Exercici 4

a) $\mathcal{R}e l = \dfrac{l}{\mu_0 \mu_r S} = \dfrac{\pi D_m}{\mu_0 \mu_r S} = \dfrac{\pi\cdot 0{,}08}{4\pi\cdot 10^{-7}\cdot 2000\cdot 314{,}2\cdot 10^{-6}} = 318{,}3\ \text{kAWb}^{-1}$

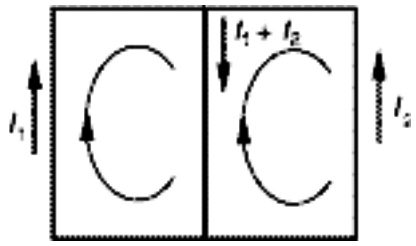
b) $\Phi_{màx} = \dfrac{N I_{màx}}{\mathcal{R}e l} = \dfrac{40\cdot\sqrt{2}}{318{,}3\cdot 10^3} = 0{,}1777\ \text{mWb}$

$B_{màx} = \dfrac{\Phi_{màx}}{S} = \dfrac{0{,}1777\cdot 10^{-3}}{314{,}2\cdot 10^{-6}} = 0{,}5657\ \text{T}$

OPCIÓ B

Exercici 3

a)



$$\left.\begin{array}{l} -U_1 + R_4 I_1 + R_1(I_1 + I_2) = 0 \\ U_2 - R_2 I_2 - R_3 I_2 - R_1(I_1 + I_2) = 0 \end{array}\right\} \Rightarrow \left\{\begin{array}{l} (R_1 + R_4) I_1 + R_1 I_2 = U_1 \\ R_1 I_1 + (R_1 + R_2 + R_3) I_2 = U_2 \end{array}\right\} \Rightarrow \left\{\begin{array}{l} 12 I_1 + 10 I_2 = 46 \\ 10 I_1 + 12 I_2 = 42 \end{array}\right\} \Rightarrow \left\{\begin{array}{l} I_1 = 3\ \text{A} \\ I_2 = 1\ \text{A} \end{array}\right\}$$

b) $V(R_1) = R_1(I_1 + I_2) = 4\cdot 10 = 40\ \text{V}$

c) $P_1 = U_1 I_1 = 46\cdot 3 = 138\ \text{W}$

$P_2 = U_2 I_2 = 42\cdot 1 = 42\ \text{W}$

Exercici 4

a) $P_C = S_C = 3$ kW, $Q_C = 0$ VAr

$$S_R = \frac{P_R}{\cos \varphi_R} = \frac{1500}{0,8} = 1875 \text{ VA}$$

$$Q_R = \sqrt{S_R^2 - P_R^2} = \sqrt{1875^2 - 1500^2} = 1125 \text{ VAr}$$

$$P = P_R + P_C = 1500 + 3000 = 4500 \text{ W}$$

$$Q = Q_R + Q_C = 1125 + 0 = 1125 \text{ VAr}$$

$$S = \sqrt{P^2 + Q^2} = \sqrt{4500^2 + 1125^2} = 4639 \text{ VA}$$

b) $I = \frac{S}{U} = \frac{4639}{220} = 21,08$ A

c) $fdp = \cos \varphi = \frac{P}{S} = \frac{4500}{4638,5} = 0,9701$

d) 25 A per ser el menor superior o igual al corrent. Més grans desprotegeixen i més petits poden provocar desconnexions intempestives