

Sèrie 6

Primera part**Exercici 1**

Q1 d Q2 d Q3 b Q4 b Q5 c

Exercici 2

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

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

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

$$b) \text{ fdp} = \cos \phi = \frac{R}{Z} = \frac{10}{14,14} = 0,707$$

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

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

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

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

Segona part

OPCIÓ A

Exercici 3

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

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

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

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

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

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

c)

$$\left\{ \begin{array}{l} X_{50} = 2 \cdot 50 \cdot \pi \cdot L - \frac{1}{2 \cdot 50 \cdot \pi \cdot C} = 0 \\ X_{100} = 2 \cdot 100 \cdot \pi \cdot L - \frac{1}{2 \cdot 100 \cdot \pi \cdot C} = 47,13 \end{array} \right\} \Rightarrow \left\{ \begin{array}{l} 2 \cdot 50 \cdot \pi \cdot L = \frac{1}{2 \cdot 50 \cdot \pi \cdot C} \\ 2 \cdot 100 \cdot \pi \cdot L - 50 \cdot \pi \cdot L = 47,13 \end{array} \right\} \Rightarrow \left\{ \begin{array}{l} L = 100 \text{ mH} \\ C = 101,3 \text{ } \mu\text{F} \end{array} \right\}$$

Exercici 4

$$\text{a) } \text{Re}l = \frac{l}{m_0 m_r S} = \frac{\pi D_m}{m_0 m_r S} = \frac{\pi \cdot 0,08}{4\pi \cdot 10^{-7} \cdot 2000 \cdot 314,2 \cdot 10^{-6}} = 318,3 \text{ kAWb}^{-1}$$

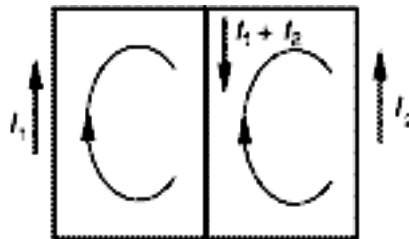
$$\text{b) } F_{\text{màx}} = \frac{N I_{\text{màx}}}{\text{Re}l} = \frac{40 \cdot \sqrt{2}}{318,3 \cdot 10^3} = 0,1777 \text{ mWb}$$

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

OPCIÓ B

Exercici 3

a)



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

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

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

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

Exercici 4

a) $P_C = S_C = 3 \text{ kW}$, $Q_C = 0 \text{ VAr}$

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

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

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

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

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

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

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

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