

**SÈRIE 4****Primera part****Exercici 1**

Q1 b    Q2 c    Q3 d    Q4 a    Q5 c

**Exercici 2**

$$a) Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{4^2 + (8 - 2)^2} = 7,211 \ \Omega$$

$$b) I = \frac{U}{Z} = \frac{230}{7,211} = 31,90 \text{ A}$$

$$c) fdp = \cos \varphi = \frac{R}{Z} = \frac{4}{7,211} = 0,5547(i)$$

$$d) X'_C = 2X_C = 4 \ \Omega; \quad X'_L = \frac{X_L}{2} = 4 \ \Omega$$

$$Z' = \sqrt{R^2 + (X'_L - X'_C)^2} = R \Rightarrow fdp' = 1$$

**OPCIÓ A****Exercici 3**

$$a) I_R = \frac{U}{R} = \frac{660}{10} = 66 \text{ A}; \quad I_C = \frac{U}{X} = \frac{660}{20} = 33 \text{ A}$$

$$I_b = \sqrt{I_R^2 + I_C^2} = \sqrt{66^2 + 33^2} = 73,79 \text{ A}$$

$$b) I_1 = \sqrt{3}I_b = 127,8 \text{ A}$$

$$c) P = 3 \frac{U^2}{R} = 3 \frac{660^2}{10} = 130,7 \text{ kW}$$

$$Q = -3 \frac{U^2}{X} = -3 \frac{660^2}{20} = -65,34 \text{ kvar}$$

$$d) S = \sqrt{P^2 + Q^2} = 146,1 \text{ kVA}$$

$$fdp = \cos \varphi = \frac{P}{S} = \frac{130,68}{146,1} = 0,8944 \text{ (c)}$$

**Exercici 4**

$$a) E = U - R_i I = 24 - 0,75 \cdot 2 = 22,5 \text{ V}$$

$$b) \Gamma = \frac{P_{\text{mec}}}{\omega} = \frac{EI}{\omega} = \frac{22,5 \cdot 2}{764 \frac{2\pi}{60}} = 0,5625 \text{ Nm}$$

$$c) \eta = 100 \frac{P_{\text{mec}}}{P} = 100 \frac{EI}{UI} = 100 \frac{E}{I} = 100 \frac{22,5}{24} = 93,75 \%$$

**OPCIÓ B****Exercici 3**

$$a) r_t = \frac{V_1}{V_2} = \frac{230}{48} = 4,792;$$

$$b) I_R = \frac{V_2}{R} = \frac{48}{4} = 12 \text{ A}; \quad I_L = \frac{V_2}{X} = \frac{48}{12} = 4 \text{ A}$$

$$I_2 = \sqrt{I_R^2 + I_L^2} = \sqrt{12^2 + 4^2} = 12,65 \text{ A}$$

$$c) I_1 = \frac{I_2}{r_t} = \frac{12,65}{4,792} = 2,640 \text{ A}$$

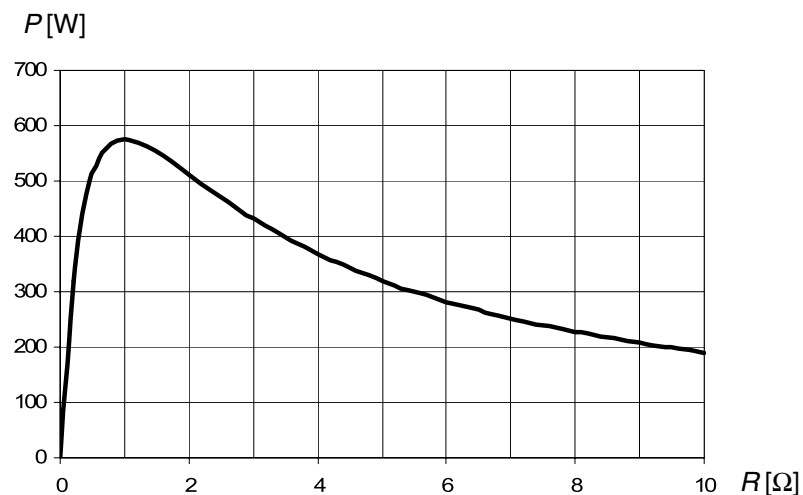
$$d) Q = V_2 I_L = 48 \cdot 4 = 192 \text{ var}$$

**Exercici 4**

$$a) P(R) = RI^2 = R \left( \frac{2U}{R+2R_i} \right)^2 = 4U^2 \frac{R}{(R+2R_i)^2} = 2304 \frac{R}{(R+1)^2} \text{ W}$$

b)

$$c) R = 2R_i = 1 \text{ } \Omega$$



## SÈRIE 1

### Primera part

#### Exercici 1

Q1 b    Q2 b    Q3 a    Q4 c    Q5 a

#### Exercici 2

$$a) Z = \sqrt{R^2 + X^2} = \sqrt{4^2 + 2^2} = 4,472 \ \Omega; \quad I_b = \frac{U}{Z} = 89,44 \ \text{A}$$

$$b) I_l = \sqrt{3} I_b = 154,9 \ \text{A}$$

$$c) P = 3R I_b^2 = 96 \ \text{kW}$$

$$d) Q = 3X I_b^2 = 48 \ \text{kvar}$$

$$e) \text{fdp} = \cos \varphi = \frac{P}{S} = \frac{P}{\sqrt{P^2 + Q^2}} = \frac{96}{\sqrt{96^2 + 48^2}} = 0,8944$$

#### OPCIÓ A

#### Exercici 3

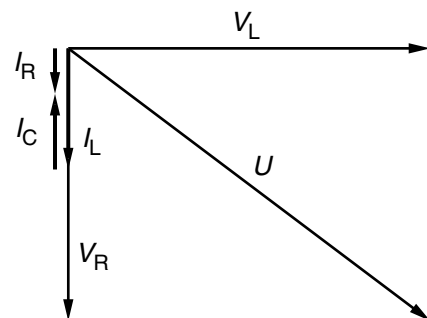
$$a) V_L = V_C = X_C I_C = 16 \cdot 10 = 160 \ \text{V}$$

$$I_L = \frac{V_L}{X_L} = \frac{160}{10} = 16 \ \text{A}$$

$$b) I_R = I_L - I_C = 6 \ \text{A}$$

$$c) U = \sqrt{V_R^2 + V_L^2} = \sqrt{(R I_R)^2 + V_L^2}$$

$$U = \sqrt{(20 \cdot 6)^2 + 160^2} = 200 \ \text{V}$$



#### Exercici 4

$$a) \eta = 100 \frac{P}{\sqrt{3} UI \cos \varphi} = 100 \frac{22000}{\sqrt{3} 400 \cdot 39 \cdot 0,85} = 95,79\%$$

b)  $p = 4$  parells de pols

$$c) n = 725 \text{ min}^{-1} \Rightarrow \omega = 75,92 \frac{\text{rad}}{\text{s}}; \quad \Gamma = \frac{P}{\omega} = 289,8 \text{ Nm}$$

$$d) \text{ Triangle, } I_1 = 68 \text{ A, } I_b = 39 \text{ A}$$

## OPCIÓ B

## Exercici 3

$$a) I_1 = \frac{U_1}{R_1 + R_2} = \frac{24}{10} = 2,4 \text{ A}; \quad I_2 = \frac{U_2}{R_3 + R_4} = \frac{12}{12} = 1 \text{ A}$$

$$b) P_1 = U_1 I_1 = 57,6 \text{ W}; \quad P_2 = U_2 I_2 = 12 \text{ W}$$

$$c) R_{13} = \frac{R_1 R_3}{R_1 + R_3} = 3 \text{ } \Omega;$$

$$\begin{cases} U_2 = R_4 I_2' + R_{13}(I_1' + I_2') \\ U_1 = R_2 I_1' + R_{13}(I_1' + I_2') \end{cases} \Rightarrow \begin{cases} 12 = 6I_2' + 3(I_1' + I_2') \\ 24 = 4I_1' + 3(I_1' + I_2') \end{cases} \Rightarrow \begin{cases} I_1' = 3,333 \text{ A} \\ I_2' = 0,2222 \text{ A} \end{cases}$$

$$P_1' = U_1 I_1' = 80 \text{ W}; \quad P_2' = U_2 I_2' = 2,667 \text{ W}$$

## Exercici 4

$$a) I = \frac{P}{U} = \frac{2000}{230} = 8,696 \text{ A}$$

$$b) R = \rho \frac{2L}{S} = 0,01786 \frac{2 \cdot 30}{4} = 0,2679 \text{ } \Omega$$

$$\Delta U(\%) = 100 \frac{RI}{U} = 100 \frac{0,2679 \cdot 8,696}{230} = 1,01\%$$

$$c) 10 \text{ A}$$