Primera part

Exercici 1

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

Exercici 2

a) $R_{34} = R_3 + R_4 = 6 \ \Omega$

$$U_2 - U_1 + R_2 I_3 = 0 \Rightarrow I_3 = \frac{U_1 - U_2}{R_2} = \frac{44 - 36}{4} = 2A$$

b) $I_2 + I_3 = \dfrac{U_2}{R_{34}} = \dfrac{36}{6} = 6 \ A$
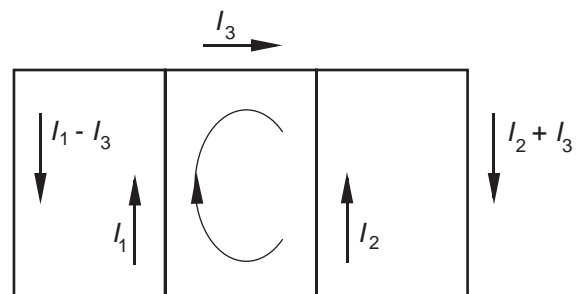
$\quad I_2 = (I_2 + I_3) - I_3 = 6 - 2 = 4 \ A$

c) $I_1 - I_3 = \dfrac{U_1}{R_1} = \dfrac{44}{8,8} = 5 \ A$
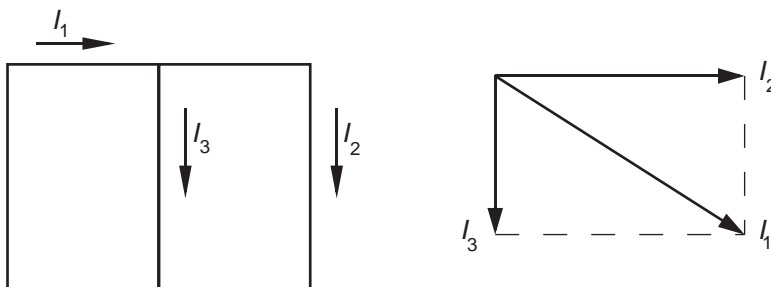
$\quad I_1 = (I_1 - I_3) + I_3 = 5 + 2 = 7 \ A$

d) $V_1 = U_2 \dfrac{R_4}{R_{34}} = 36 \dfrac{4}{6} = 24 \ V$

e) $P_1 = U_1 I_1 = 44 \cdot 7 = 308 \ W$

$\quad P_2 = U_2 I_2 = 36 \cdot 4 = 144 \ W$

Segona part

OPCIÓ A

Exercici 3

a) $\overline{I}_1 = \overline{I}_2 + \overline{I}_3$; $I_1^2 = I_2^2 + I_3^2 \Rightarrow I_3 = \sqrt{I_1^2 - I_2^2} = \sqrt{13^2 - 11^2} = 6,928 \ A$

b) $R = \dfrac{V_1}{I_2} = \dfrac{220}{11} = 20 \ \Omega$

c) $X_L = \dfrac{V_1}{I_3} = \dfrac{220}{6{,}928} = 31{,}75 \ \Omega$

$L = \dfrac{X_L}{\omega} = \dfrac{X_L}{2\pi f} = \dfrac{31{,}75}{2\pi 50} = 0{,}1011 \ \text{H}$

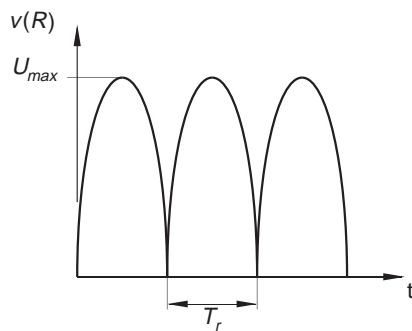d) $P = V_1 I_2 = 220 \cdot 11 = 2420 \ \text{W}$

$Q = V_1 I_3 = 220 \cdot 6{,}928 = 1524 \ \text{VAr}$

$S = \sqrt{P^2 + Q^2} = \sqrt{2420^2 + 1524^2} = 2860 \ \text{VA}$

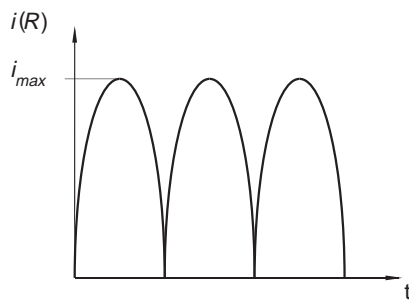$fdp = \cos\varphi = \dfrac{P}{S} = \dfrac{2420}{2860} = 0{,}8461$

Exercici 4

a)

$U_{màx} = \dfrac{U}{r_t}\sqrt{2} = \dfrac{220}{10}\sqrt{2} = 31{,}11 \ \text{V} \; ;$

$T_r = \dfrac{T}{2} = \dfrac{1}{2f} = \dfrac{1}{2 \cdot 50} = 10 \ \text{ms}$

b)

$I_{màx} = \dfrac{U_{màx}}{R} = \dfrac{31{,}11}{10} = 3{,}111 \ \text{A}$

c) $U_{màx} = \dfrac{U}{r_t}\sqrt{2} - 2V_F = 29{,}11 \ \text{V}$

$I_{màx} = \dfrac{U_{màx}}{R} = \dfrac{29{,}11}{10} = 2{,}911 \ \text{A}$

$P_{màx} = 2\,V_F I_{màx} = 5{,}822 \ \text{W}$

OPCIÓ B

Exercici 3

a) $C_{eq} = C_1 + C_2 + C_{3x} \Rightarrow C_{3x} = C_{eq} - C_1 - C_2 = 50\text{-}20\text{-}22 = 8 \ \mu F$

$$\frac{1}{C_3} + \frac{1}{C_x} = \frac{1}{C_{3x}} \Rightarrow C_x = \frac{C_3 C_{3x}}{C_3 - C_{3x}} = \frac{8 \cdot 10}{10 - 8} = 40 \ \mu F$$

b) $\tau = RC = 100 \cdot 50 \cdot 10^{-6} = 5 \ ms$

c) $U(C_1) = U(C_2) = V = 100 \ V$

$Q_{3x} = C_{3x} V = 8 \cdot 10^{-6} \cdot 100 = 0,8 \cdot 10^{-3} \ C$

$U(C_3) = \dfrac{Q_{3x}}{C_3} = \dfrac{0,8 \cdot 10^{-3}}{10 \cdot 10^{-6}} = 80 \ V$

$U(C_x) = \dfrac{Q_x}{C_x} = \dfrac{0,8 \cdot 10^{-3}}{40 \cdot 10^{-6}} = 20 \ V$

Exercici 4

a) $E = U - R_i I = 300 - 1,2 \cdot 10 = 288 \ V$

$$\frac{E}{n} = k\Phi_{\text{màx}} = \frac{E_0}{n_0} \Rightarrow n = \frac{E}{E_0} n_0 = \frac{288}{300} 1600 = 1536 \ \text{min}^{-1}$$

b) $P_{\text{pèrdues}} = R_i I^2 = 1,2 \cdot 10^2 = 120 \ W$

$P_{\text{elèctrica}} = VI = 300 \cdot 10 = 3000 \ W$

$P_{\text{útil}} = P_{\text{elèctrica}} - P_{\text{pèrdues}} = 3000 - 120 = 2880 \ W$

$\eta(\%) = 100 \dfrac{P_{\text{útil}}}{P_{\text{elèctrica}}} = 100 \dfrac{2880}{3000} = 96 \ \%$

c) $\Gamma' = \Gamma \Rightarrow k\Phi' I' = k\Phi I \Rightarrow I' = \dfrac{\Phi}{\Phi'} I = \dfrac{1}{0,8} 10 = 12,5 \ A$