

**SÈRIE 3****Primera part****Exercici 1**

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

**Exercici 2**

$$a) A_1 = \frac{U_1}{R_1} = \frac{100}{100} = 1 \text{ A}$$

$$b) A_2 = \frac{U_1}{R_2} = \frac{100}{200} = 0,5 \text{ A}$$

$$c) A_3 = 0 \text{ A}$$

$$d) W_1 = U_1 \cdot I = U_1 \cdot (A_1 + A_2) = 100 \cdot (1 + 0,5) = 150 \text{ W}$$

**OPCIÓ A****Exercici 3**

$$a) A_2 = \frac{V_2}{R_2} = \frac{200}{10} = 20 \text{ A}$$

$$b) r_t = \frac{U_{1N}}{U_{2N}} = \frac{400}{230} \rightarrow r_t = \frac{A_2}{A_1} = \frac{400}{230} \rightarrow A_1 = \frac{A_2}{r_t} = \frac{20 \cdot 230}{400} = 11,5 \text{ A}$$

$$c) W_1 = R_1 A_1^2 + R_2 A_2^2 \rightarrow R_1 = \frac{W_1 - R_2 A_2^2}{A_1^2} = \frac{5300 - 10 \cdot 20^2}{11,5^2} = 9,83 \Omega$$

$$d) U_1 = \frac{W_1}{A_1} = \frac{5300}{11,5} = 460,9 \text{ V}$$

**Exercici 4**

$$a) \eta(\%) = 100 \frac{P}{UI} = 100 \frac{250}{36 \cdot 7,62} = 91,13 \%$$

$$b) E = \frac{P}{I} = \frac{250}{7,62} = 32,81 \text{ V}; \quad R_i = \frac{U-E}{I} = \frac{36-32,81}{7,62} = 0,419 \Omega$$

$$c) E' = U - R_i \cdot 0,6 \cdot I = 36 - 0,419 \cdot 0,6 \cdot 7,62 = 34,08 \text{ V}$$

$$n' = n \frac{E'}{E} = 3850 \frac{34,08}{32,81} = 3999 \text{ min}^{-1}$$

## OPCIÓ B

## Exercici 3

$$a) X_C = \frac{1}{\omega C} = \frac{1}{2\pi f C} = \frac{1}{2\pi \cdot 50 \cdot 20 \cdot 10^{-6}} = 159,2 \Omega$$

$$A_1 = \frac{U}{X_C} = \frac{400}{159,2} = 2,51 \text{ A}$$

$$b) A_2 = \frac{U}{R} = \frac{400}{100} = 4 \text{ A}$$

$$c) A_3 = \sqrt{A_1^2 + A_2^2} = \sqrt{2,51^2 + 4^2} = 4,72 \text{ A}$$

$$d) A_4 = \sqrt{3} A_3 = \sqrt{3} \cdot 4,72 = 8,18 \text{ A}$$

$$e) P_{\text{Total}} = 3 \cdot R \cdot A_2^2 = 3 \cdot 100 \cdot 4^2 = 4800 \text{ W}$$

## Exercici 4

$$a) f = \frac{1}{T} = \frac{1}{4 \cdot 10^{-3}} = 250 \text{ Hz}$$

$$b) U_{\text{màx}} = \frac{R_1 + R_2}{R_2} U_{R2 \text{ màx}} = \frac{10 + 30}{30} \cdot 3,4 \cdot 20 = 90,67 \text{ V}$$

$$c) U_{\text{RMS}} = \frac{U_{\text{màx}}}{\sqrt{2}} = \frac{90,67}{\sqrt{2}} = 64,11 \text{ V}$$

## SÈRIE 4

## Primera part

## Exercici 1

Q1 a    Q2 a    Q3 a    Q4 d    Q5 d

## Exercici 2

a)

$$\begin{cases} R_1 I_1 + R_2(I_1 + I_2) = U_1 + U_2 + U_3 \\ R_3 I_2 + R_2(I_1 + I_2) = U_4 \end{cases} \rightarrow \begin{cases} (R_1 + R_2)I_1 + R_2 I_2 = U_1 + U_2 + U_3 \\ R_2 I_1 + (R_2 + R_3)I_2 = U_4 \end{cases}$$

$$\begin{bmatrix} R_1 + R_2 & R_2 \\ R_2 & R_2 + R_3 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} U_1 + U_2 + U_3 \\ U_4 \end{bmatrix} \rightarrow \begin{bmatrix} 13 & 10 \\ 10 & 15 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} 22 \\ 10 \end{bmatrix}$$

$$\begin{aligned} I_1 &= 2,421 \text{ A} \\ I_2 &= -0,947 \text{ A} \end{aligned}$$

$$\text{b) } P_{R_2} = R_2(I_1 + I_2)^2 = 10(2,421 - 0,947)^2 = 21,73 \text{ W}$$

c)

$$\begin{aligned} P_{U_1} &= U_1 I_1 = 5 \cdot 2,421 = 12,105 \text{ W} \\ P_{U_2} &= U_2 I_1 = 7 \cdot 2,421 = 16,947 \text{ W} \\ P_{U_3} &= U_3 I_1 = 10 \cdot 2,421 = 24,21 \text{ W} \\ P_{U_4} &= U_4 I_2 = 10 \cdot (-0,947) = -9,47 \text{ W} \end{aligned}$$

## OPCIÓ A

## Exercici 3

$$\text{a) } p = 4$$

$$\text{b) } \Gamma = \frac{P}{\omega} = \frac{4000}{728 \frac{2\pi}{60}} = 52,47 \text{ N m}$$

$$\text{c) } \eta(\%) = 100 \frac{P}{\sqrt{3}UI \cos \varphi} = 100 \frac{4000}{\sqrt{3} \cdot 400 \cdot 10,2 \cdot 0,67} = 84,48 \%$$

$$\text{d) } 4 \text{ kW}$$

**Exercici 4**

$$b) I = \frac{P}{U} = \frac{12}{15} = 0,8 \text{ A}$$

$$230 = RI + 12 \cdot U \quad \rightarrow \quad R = \frac{230 - 12 \cdot U}{I} = \frac{230 - 12 \cdot 15}{0,8} = 62,5 \Omega$$

$$b) P_R = RI^2 = 62,5 \cdot 0,8^2 = 40 \text{ W}$$

$$c) P_{\text{Total}} = P_R + 12 \cdot P_{\text{Làmpada}} = 40 + 12 \cdot 12 = 184 \text{ W}$$

$$d) P = 0 \text{ W}$$

**OPCIÓ B****Exercici 3**

$$a) V_2 = R_2 A_2 = 50 \cdot 1,437 = 71,85 \text{ V}$$

$$b) A_3 = \frac{V_2}{X_L - X_C} = \frac{71,85}{50 - 30} = 3,593 \text{ A}$$

$$c) A_1 = \sqrt{A_2^2 + A_3^2} = \sqrt{1,437^2 + 3,593^2} = 3,87 \text{ A}$$

$$d) W_2 = R_2 A_2^2 = 50 \cdot 1,437^2 = 103,25 \text{ W}$$

$$e) W_1 = R_1 A_1^2 + W_2 = 50 \cdot 3,87^2 + 103,25 = 852,1 \text{ W}$$

**Exercici 4**

$$a) \eta(\%) = 100 \frac{P}{U \cdot I} = 100 \frac{60}{36 \cdot 2} = 83,33 \%$$

$$b) \Gamma = \frac{P}{\omega} = \frac{60}{7840 \frac{2\pi}{60}} = 73,08 \text{ mN m}$$

$$c) E = \frac{P}{I} = \frac{60}{2} = 30 \text{ V}$$

$$R_i = \frac{U - U_b - E}{I} = \frac{36 - 1,2 - 30}{2} = 2,4 \Omega$$

$$d) E' = U' - R_i \cdot 0,7 \cdot I - U_b = 30 - 2,4 \cdot 0,7 \cdot 2 - 1,2 = 25,44 \text{ V}$$

$$n' = n \frac{E'}{E} = 7840 \frac{25,44}{30} = 6648,3 \text{ min}^{-1}$$