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

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

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

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

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

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OPCIÓ B

Exercici 3

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

$A_1 = \frac{U}{X_{\mathrm{C}}} = \frac{400}{159{,}2} = 2{,}51\ \mathrm{A}$

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

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

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

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

Exercici 4

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

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

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

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SÈRIE 4

Primera part

Exercici 1

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

Exercici 2

a)

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

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

$$I_1 = 2{,}421 \text{ A}$$
$$I_2 = -0{,}947 \text{ A}$$

b) $P_{\mathrm{R2}} = R_2(I_1 + I_2)^2 = 10(2{,}421 - 0{,}947)^2 = 21{,}73 \text{ W}$

c)

$$P_{\mathrm{U1}} = U_1 I_1 = 5 \cdot 2{,}421 = 12{,}105 \text{ W}$$
$$P_{\mathrm{U2}} = U_2 I_1 = 7 \cdot 2{,}421 = 16{,}947 \text{ W}$$
$$P_{\mathrm{U3}} = U_3 I_1 = 10 \cdot 2{,}421 = 24{,}21 \text{ W}$$
$$P_{\mathrm{U4}} = U_4 I_2 = 10 \cdot (-0{,}947) = -9{,}47 \text{ W}$$

OPCIÓ A

Exercici 3

a) $p = 4$

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

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

d) 4 kW

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

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

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) $A_3 = \frac{V_2}{X_{\text{L}} - X_{\text{C}}} = \frac{71{,}85}{50-30} = 3{,}593\ \text{A}$

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

$R_{\text{i}} = \frac{U - U_{\text{b}} - E}{I} = \frac{36 - 1{,}2 - 30}{2} = 2{,}4\ \Omega$

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

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

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