

Sèrie 2**Primera part****Exercici 1**

Q1 a Q2 d Q3 a Q4 a Q5 c

Exercici 2

$$a) X_{C1} = \frac{1}{\omega C_1} = \frac{1}{2\pi f C_1} = \frac{1}{2\pi \cdot 50 \cdot 100 \cdot 10^{-6}} = 31,83 \Omega$$

$$A_1 = \frac{V_1}{\sqrt{R_1^2 + X_{C1}^2}} = \frac{230}{\sqrt{200^2 + 31,83^2}} = 1,14 \text{ A}$$

$$b) X_{L2} = \omega L_2 = 2\pi f L_2 = 2\pi \cdot 50 \cdot 100 \cdot 10^{-3} = 31,42 \Omega$$

$$A_2 = \frac{V_1}{\sqrt{R_2^2 + X_{L2}^2}} = \frac{230}{\sqrt{100^2 + 31,42^2}} = 2,19 \text{ A}$$

$$c) W = R_1 A_1^2 + R_2 A_2^2 = 200 \cdot 1,14^2 + 100 \cdot 2,19^2 = 739,53 \text{ W}$$

OPCIÓ A

Exercici 3

$$a) A_1 = \sqrt{\frac{P}{R}} = \sqrt{\frac{365}{100}} = 1,91 \text{ A}$$

$$b) S = \frac{P}{\cos \varphi} = \frac{365}{0,83} = 439,76 \text{ VA}; \quad Q = S \sin \varphi = 439,76 \sqrt{1 - 0,83^2} = 245,28 \text{ var}$$

$$V_1 = \frac{Q}{A_1} = \frac{245,28}{1,91} = 128,42 \text{ V}$$

$$c) A_2 = \frac{Q}{U} = \frac{245,28}{230} = 1,07 \text{ A}$$

Exercici 4

$$a) R_{\text{Conductor}} = \rho \frac{L}{S} = 0,01786 \cdot 10^{-6} \cdot \frac{15}{2,5 \cdot 10^{-6}} = 107,16 \text{ m}\Omega$$

$$R_{\text{Calefactor}} = \frac{U_N^2}{P_N} = \frac{50^2}{1000} = 2,5 \text{ }\Omega$$

$$I = \frac{U}{R_{\text{Calefactor}} + 2R_{\text{Conductor}}} = \frac{30}{2,5 + 2 \cdot 0,10716} = 11,052 \text{ A}$$

$$c_{dt_{\text{Cable}}}(\%) = 100 \frac{U_{\text{Cable}}}{U} = 100 \frac{2R_{\text{Conductor}}I}{U} = 100 \frac{2 \cdot 0,10716 \cdot 11,052}{30} = 7,9 \%$$

$$b) P_{\text{Calefactor}} = R_{\text{Calefactor}} I^2 = 2,5 \cdot 11,052^2 = 305,4 \text{ W}$$

c) Calibre de 16 A

$$d) I_{CC} = \frac{U}{2R_{\text{Conductor}}} = \frac{30}{2 \cdot 0,10716} = 140 \text{ A}$$

OPCIÓ B

Exercici 3

$$a) \eta(\%) = 100 \frac{P}{UI} = 100 \frac{250}{48 \cdot 6} = 86,81 \%$$

$$b) \Gamma = \frac{P}{\omega} = \frac{250}{3340 \frac{2\pi}{60}} = 0,7148 \text{ Nm}$$

$$c) \begin{aligned} E &= \frac{P}{I} = \frac{250}{6} = 41,67 \text{ V} & R_1 I &= U - E = 48 - 41,67 = 6,33 \text{ V} \\ E' &= U' - R_1 I = 37 - 6,33 = 30,67 \text{ V} \\ n' &= n \frac{E'}{E} = 3340 \frac{30,67}{41,67} = 2458,3 \text{ min}^{-1} \end{aligned}$$

Exercici 4

$$a) I_2 = 0 \rightarrow P_{R2} = 0 \text{ W}$$

$$I_3 = \frac{U_2}{R_3} = \frac{12}{10} = 1,2 \text{ A} \rightarrow P_{R3} = R_3 I_3^2 = 10 \cdot 1,2^2 = 14,4 \text{ W}$$

$$I_1 = I_4 = \frac{U_1 - U_2}{R_1 + R_4} = \frac{24 - 12}{1 + 5} = 2 \text{ A} \rightarrow \begin{cases} P_{R1} = R_1 I_1^2 = 1 \cdot 2^2 = 4 \text{ W} \\ P_{R4} = R_4 I_4^2 = 5 \cdot 2^2 = 20 \text{ W} \end{cases}$$

$$b) P_{U1} = U_1 I_1 = 24 \cdot 2 = 48 \text{ W}$$

$$P_{U2} = U_2 I_5 = U_2 (I_3 - I_4) = 12 \cdot (1,2 - 2) = -9,6 \text{ W}$$

$$c) I_3 = \frac{U_2}{R_3} = \frac{12}{10} = 1,2 \text{ A}$$

$$I_1 = I_2 = \frac{U_1 - U_2}{R_1 + R_2} = \frac{24 - 12}{1 + 20} = 0,571 \text{ A}$$

$$P_{U1} = U_1 I_1 = 24 \cdot 0,571 = 13,7 \text{ W}$$

$$P_{U2} = U_2 I_5 = U_2 (I_3 - I_2) = 12 \cdot (1,2 - 0,571) = 7,55 \text{ W}$$

SÈRIE 4**Primera part****Exercici 1**

Q1 b Q2 c Q3 d Q4 d Q5 a

Exercici 2

$$a) I_1 = \frac{U_1}{R_1 + \frac{R_2 R_3}{R_2 + R_3}} = \frac{10}{5 + \frac{15 \cdot 10}{15 + 10}} = 0,9091 \text{ A}$$

$$b) I_3 = \frac{U_1 - R_1 I_1}{R_3} = \frac{10 - 5 \cdot 0,9091}{10} = 0,5455 \text{ A}$$

$$c) P_{R_2} = \frac{(U_1 - R_1 I_1)^2}{R_2} = \frac{(10 - 5 \cdot 0,9091)^2}{15} = 1,984 \text{ W}$$

$$d) P_{U_1} = U_1 I_1 = U_1 \frac{U_1 - U_2}{R_1} = 10 \frac{10 - 15}{5} = -10 \text{ W}$$

$$e) P_{U_2} = P_{R_1} + P_{R_3} - P_{U_1} = \frac{(U_1 - U_2)^2}{R_1} + \frac{U_2^2}{R_3} - P_{U_1} = \frac{(10 - 15)^2}{5} + \frac{15^2}{10} + 10 = 37,5 \text{ W}$$

OPCIÓ A

Exercici 3

a) $p = 2$

b) $\Gamma = \frac{P_N}{\omega_N} = \frac{2200}{1450 \frac{2\pi}{60}} = 14,49 \text{ N m}$

c) $P = \sqrt{3} U_N I_N \cos \varphi_N = \sqrt{3} \cdot 400 \cdot 4,7 \cdot 0,78 = 2540 \text{ W}$
Alternativament,

$P = \sqrt{3} U_N I_N \cos \varphi_N = \sqrt{3} \cdot 690 \cdot 2,71 \cdot 0,78 = 2526 \text{ W}$

d) $\eta(\%) = 100 \frac{P_N}{P} = 100 \frac{2200}{2540} = 86,61 \%$

Alternativament,

$\eta(\%) = 100 \frac{P_N}{P} = 100 \frac{2200}{2526} = 87,09 \%$

e) $S_0 = \sqrt{3} U_N I_0 = \sqrt{3} \cdot 400 \cdot 4 = 2771 \text{ VA}$

Exercici 4

a) $R_{\text{Eq. 20 Làmp}} = \frac{U_{\text{Nom Làmp}}^2}{20 P_{\text{Nom Làmp}}} = \frac{230^2}{20 \cdot 100} = 26,45 \Omega$

$R_{\text{Línia}} = \rho \frac{l}{S} = 16,8 \cdot 10^{-9} \frac{200}{1,5 \cdot 10^{-6}} = 2,24 \Omega$

$I = \frac{U}{R} = \frac{U}{2 R_{\text{Línia}} + R_{\text{Eq. 20 Làmp}}} = \frac{230}{2 \cdot 2,24 + 26,45} = 7,436 \text{ A}$

b) $\Delta U(\%) = 100 \frac{U_{\text{Inici línia}} - U_{\text{Final línia}}}{U} = 100 \frac{2 R_{\text{Línia}} I}{U} = 100 \frac{2 \cdot 2,24 \cdot 7,436}{230} = 14,48 \%$

c) $P_{\text{Làmp}} = U_{\text{Làmp}} I_{\text{Làmp}} = U_{\text{Final línia}} \frac{I}{20} = (230 - 2 \cdot 2,24 \cdot 7,436) \frac{7,436}{20} = 73,13 \text{ W}$

d) $I_{\text{CC}} = \frac{U}{2 R_{\text{Línia}}} = \frac{230}{2 \cdot 2,24} = 51,34 \text{ A}$

OPCIÓ B

Exercici 3

$$\text{a) } I_1 = A_1 = 6 \text{ A} \quad \rightarrow \quad I_3 = \frac{R_2}{R_2+R_3} I_1 = \frac{60}{60+20} 6 = 4,5 \text{ A}$$

$$P_{R_3} = R_3 I_3^2 = 20 \cdot 4,5^2 = 405 \text{ W}$$

$$\text{b) } P = R_1 I_1^2 + W = 10 \cdot 6^2 + 540 = 900 \text{ W}$$

$$\text{c) } U = \frac{P}{I} = \frac{900}{6} = 150 \text{ V}$$

Exercici 4

$$\text{a) } \Gamma = \frac{P}{\omega} = \frac{43000}{1133 \frac{2\pi}{60}} = 362,4 \text{ Nm}$$

$$\text{b) } E = \frac{P}{I} = \frac{43000}{121} = 355,4 \text{ V}; \quad R_i = \frac{U-E}{I} = \frac{420-355,4}{121} = 0,5341 \Omega$$

$$\text{c) } E' = U' - R_i \frac{I}{2} = 400 - 0,5341 \frac{121}{2} = 367,7 \text{ V}$$

$$n' = n \frac{E'}{E} = 1133 \frac{367,7}{355,4} = 1172 \text{ min}^{-1}$$