

SÈRIE 3**Primera part****Exercici 1**

Q1 b Q2 a Q3 b Q4 b Q5 d

Exercici 2

a) $I_1 = \frac{U_1 - U_2}{R_1} = \frac{48 - 36}{24} = 0,5 \text{ A}$

b) $I_{R_4} = \frac{U_2}{\frac{R_2 R_3}{R_2 + R_3} + R_4} = \frac{36}{\frac{24 \cdot 24}{24 + 24} + 24} = 1 \text{ A}$

$$I_2 = I_{R_4} - I_1 = 1 - 0,5 = 0,5 \text{ A}$$

c) $P_{R_3} = R_3 I_{R_3}^2 = R_3 \left(\frac{I_{R_4}}{2} \right)^2 = 24 \left(\frac{1}{2} \right)^2 = 6 \text{ W}$

d) $I_{R_4} = \frac{U_2}{R_2 + R_4} = \frac{36}{24 + 24} = 0,75 \text{ A}$

$$I_2 = I_{R_4} - I_1 = 0,75 - 0,5 = 0,25 \text{ A}$$

$$P_U = U_1 I_1 + U_2 I_2 = 48 \cdot 0,5 + 36 \cdot 0,25 = 33 \text{ W}$$

e) $P_{R_3} = 0 \text{ W}$

OPCIÓ A**Exercici 3**

a) $p = 2$

b) $\Gamma = \frac{P_N}{\omega_N} = \frac{7500}{1460 \frac{2\pi}{60}} = 49,05 \text{ N m}$

c) $P = \sqrt{3} U_N I_N \cos \varphi_N = \sqrt{3} \cdot 400 \cdot 15,3 \cdot 0,8 = 8,48 \text{ kW}$

d) $\eta(\%) = 100 \frac{P_N}{P} = 100 \frac{7,5}{8,48} = 88,44 \%$

e) $U_{N \text{ Estrella}} = \sqrt{3} U_{N \text{ Triangle}} = \sqrt{3} \cdot 400 = 692,8 \text{ V}$

En realitat els motors tenen, a la placa de característiques, les tensions normalitzades 690/400 V

$$I_{N \text{ Estrella}} = \frac{I_{N \text{ Triangle}}}{\sqrt{3}} = \frac{15,3}{\sqrt{3}} = 8,83 \text{ A}$$

Exercici 4

$$a) R_{\text{Calef}} = \frac{U_{\text{Nom Calef}}^2}{P_{\text{Nom Calef}}} = \frac{230^2}{2000} = 26,45 \Omega$$

$$R_{\text{Línia}} = \rho \frac{l}{S} = 0,01786 \cdot 10^{-6} \frac{30}{2,5 \cdot 10^{-6}} = 0,21432 \Omega$$

$$I = \frac{U_{\text{Calef}}}{R_{\text{Calef}}} = \frac{230(1-0,05)}{26,45} = \frac{218,5}{26,45} = 8,26 \text{ A}$$

$$R_{\text{Allarg}} = \frac{U - U_{\text{Calef}} - 2 R_{\text{Línia}} I}{2 I} = \frac{230 - 218,5 - 2 \cdot 0,21432 \cdot 8,26}{2 \cdot 8,26} = 0,4818 \Omega$$

$$l_{\text{Màx Allarg}} = \frac{R_{\text{Allarg}} S}{\rho} = \frac{0,4818 \cdot 2,5 \cdot 10^{-6}}{0,01786 \cdot 10^{-6}} = 67,4 \text{ m}$$

$$b) P_{\text{Calef}} = U_{\text{Calef}} I = 218,5 \cdot 8,26 = 1805 \text{ W}$$

$$c) I_{\text{CC}} = \frac{U}{2(R_{\text{Línia}} + R_{\text{Allarg}})} = \frac{230}{2(0,21432 + 0,4818)} = 165,2 \text{ A}$$

OPCIÓ B**Exercici 3**

$$a) R_1 I_1 = R_2 I_2 \quad \rightarrow \quad I_2 = \frac{R_1}{R_2} I_1 = \frac{48}{24} I_1 = 2 I_1$$

$$W = R_1 I_1^2 + R_2 I_2^2 = R_1 I_1^2 + R_2 (2 I_1)^2 = (R_1 + 4 R_2) I_1^2 \quad \rightarrow \quad I_1 = \sqrt{\frac{W}{R_1 + 4 R_2}}$$

$$I_1 = \sqrt{\frac{500}{48 + 4 \cdot 24}} = 1,863 \text{ A} \quad I_2 = 2 I_1 = 2 \cdot 1,863 = 3,726 \text{ A}$$

$$b) U = \frac{P}{I_3} = \frac{P}{I_1 + I_2} = \frac{500}{1,863 + 3,726} = 89,46 \text{ V}$$

$$c) I_L = \frac{U}{X_L} = \frac{U}{\omega L} = \frac{U}{2 \pi f L} = \frac{89,46}{2 \pi \cdot 50 \cdot 2 \cdot 10^{-3}} = 142,38 \text{ A}$$

Exercici 4

$$a) \Gamma = \frac{P}{\omega} = \frac{129000}{878 \frac{2\pi}{60}} = 1403 \text{ Nm}$$

$$b) E = \frac{P}{I} = \frac{129000}{278} = 464,03 \text{ V}; \quad R_i = \frac{U-E}{I} = \frac{520-464,03}{278} = 0,2013 \Omega$$

$$c) E' = U' - R_i \frac{I}{2} = 450 - 0,2013 \frac{278}{2} = 422,02 \text{ V}$$

$$N' = N \frac{E'}{E} = 878 \frac{422,02}{464,03} = 798,5 \text{ min}^{-1}$$

Sèrie 5**Primera part****Exercici 1**

Q1 b Q2 c Q3 d Q4 c Q5 b

Exercici 2

$$a) R_1 = \frac{U^2}{W_1} = \frac{50^2}{250} = 10 \Omega$$

$$b) R_2 = \frac{U^2}{W_2 - W_1} = \frac{50^2}{350 - 250} = 25 \Omega$$

$$c) A_1 = \frac{U}{R_1} + \frac{U}{R_2} + \frac{U}{R_3} \rightarrow R_3 = \frac{U}{A_1 - \frac{U}{R_1} - \frac{U}{R_2}} = \frac{50}{17 - \frac{50}{10} - \frac{50}{25}} = 5 \Omega$$

$$d) W_3 = U \cdot A_1 = 50 \cdot 17 = 850 \text{ W}$$

OPCIÓ A**Exercici 3**

$$a) r_t = \frac{U_{\text{primari}}}{U_{\text{secundari}}} = \frac{230}{125} = 1,84 \quad U_2 = \frac{U_1}{r_t} = \frac{225}{1,84} = 122,3 \text{ V}$$

$$W_2 = \frac{U_2^2}{R_2} = \frac{122,3^2}{10} = 1495 \text{ W}$$

$$b) A_1 = \frac{U_1}{R_1} = \frac{225}{20} = 11,25 \text{ A}$$

$$c) A_T = A_1 + A_{21} = A_1 + \frac{A_2}{r_t} = A_1 + \frac{\frac{U_2}{R_2}}{r_t} = 11,25 + \frac{\frac{122,3}{10}}{1,84} = 17,9 \text{ A}$$

Exercici 4

$$a) \eta (\%) = 100 \frac{P}{U I} = 100 \frac{2400}{200 \cdot 14} = 85,71 \%$$

$$b) \Gamma = \frac{P}{\omega} = \frac{P}{n \frac{2\pi}{60}} = \frac{2400}{1206 \frac{2\pi}{60}} = 19 \text{ N m}$$

c) En condicions nominals:

$$E = \frac{P}{I} = \frac{2400}{14} = 171,43 \text{ V} \rightarrow R_i I = U - E = 200 - 171,43 = 28,57 \text{ V}$$

En el punt de funcionament:

$$E' = U' - R_i I = 180 - 28,57 = 151,43 \text{ V} \rightarrow n' = \frac{E'}{E} n = \frac{151,43}{171,43} 1206 = 1065,3 \text{ min}^{-1}$$

OPCIÓ B**Exercici 3**

$$a) V_1 = \frac{U}{\sqrt{3}} = \frac{400}{\sqrt{3}} = 230,9 \text{ V}$$

$$b) A_1 = \frac{V_1}{Z} = \frac{V_1}{\sqrt{R^2 + X_L^2}} = \frac{230,9}{\sqrt{250^2 + 100^2}} = 0,858 \text{ A}$$

$$c) V_2 = X_L A_1 = 100 \cdot 0,858 = 85,8 \text{ V}$$

$$d) W_1 = R A_1^2 = 250 \cdot 0,858^2 = 184,04 \text{ W}$$

Exercici 4

$$a) U = \frac{\text{Canal } 1_{\text{màx}}}{\sqrt{2}} = \frac{20 \cdot 3,4}{\sqrt{2}} = 48,08 \text{ V}$$

$$b) \text{Desfasament Canal 1 - Canal 2} = 1,6 \text{ div} \cdot 5 \frac{\text{ms}}{\text{div}} = 8 \text{ ms}$$

$$c) \text{Canal } 2_{\text{màx}} = 5 \frac{\text{V}}{\text{div}} \cdot 2,2 \text{ div} = 11 \text{ V}$$