SÈRIE 1

Primera part

Exercici 1

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

Exercici 2

a)

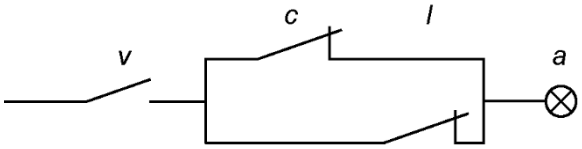
v	c	l	a
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

b) $a = (v \cdot \bar{c} \cdot \bar{l}) + (v \cdot \bar{c} \cdot l) + (v \cdot c \cdot \bar{l})$

Simplificant:

$$a = v(\bar{c} + \bar{l})$$

c)



Exercici 3

a) $\omega_r = \frac{v}{d/2} = 10{,}28$ rad/s; $\omega_{mot} = \omega_r / \tau = 128{,}5$ rad/s;

b) $P_{subm} = P_{cons}\ \eta_{red}\ \eta_{mot} = 61{,}99$ W

c) $\Gamma = P_{cons}\ \eta_{mot} / \omega_{mot} = 507{,}9$ Nmm

d) $t = E_{bat} / P_{cons} = 3{,}2$ h; $s_{rec} = v\ t = 11{,}84$ km

Exercici 4

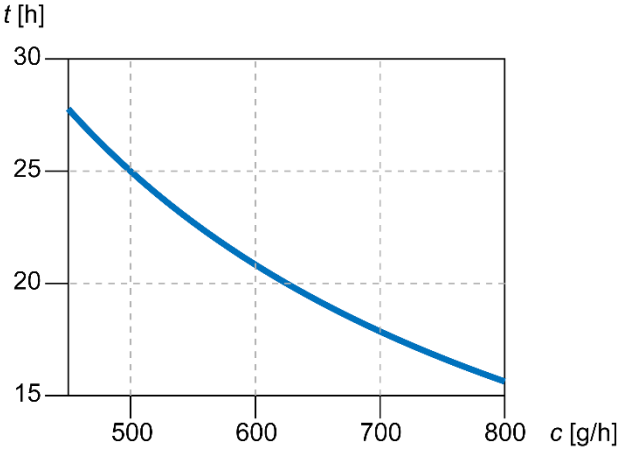
a) $P_{mín} = p_b\ c_{mín} = 6{,}201$ kW

$P_{màx} = p_b\ c_{màx} = 11{,}02$ kW

b) $t_{màx} = m_b / c_{mín} = 27{,}78$ h

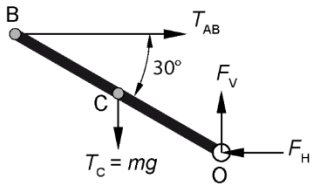
d) $m_{CO2} = c_{màx}\ n\ t_{bar}\ FE = 71{,}04$ kg

c)



Exercici 5

a)



b)

$$\sum M(\mathrm{O}) = 0 \;\rightarrow\; m\ \mathrm{g}\ L\cos(30) - T_{\mathrm{AB}}\, 2L\ \sin(30) = 0 \;\rightarrow\; T_{\mathrm{AB}} = m\,\mathrm{g}\frac{\sqrt{3}}{2} = 254{,}8\ \mathrm{N}$$

c)

$$\sigma_{\mathrm{AB}} = \frac{T_{\mathrm{AB}}}{\pi d^2/4} = 20{,}28\ \mathrm{MPa}$$

d) $\sum F_{\text{horitzontals}} = 0 \;\rightarrow\; F_{\mathrm{H}} = T_{\mathrm{AB}} \;\rightarrow\; F_{\mathrm{H}} = 254{,}8\ \mathrm{N}$

$\sum F_{\text{verticals}} = 0 \;\rightarrow\; F_{\mathrm{V}} = m \cdot \mathrm{g} \;\rightarrow\; F_{\mathrm{V}} = 294{,}2\ \mathrm{N}$

e)

$$d' = 1\ \mathrm{mm} \;\rightarrow \sigma'_{\mathrm{AB}} = \frac{T_{\mathrm{AB}}}{\pi d'^2/4} = 324{,}4\ \mathrm{MPa}$$

Com que σ'_{AB} és superior al límit elàstic del material, el tirant es deformaria permanentment i de manera irreversible. No podria mantenir la posició d'equilibri estudiada.

Exercici 6

a) $R_1 = R_2 = \rho\dfrac{L}{\pi d^2/4} = 40{,}74\ \Omega$

b) $R_{\mathrm{màx}} = R_1 + R_2 = 81{,}49\ \Omega$

$$R_{\mathrm{mín}} = \frac{1}{\dfrac{1}{R_1} + \dfrac{1}{R_2}} = 20{,}37\ \Omega$$

c) $P_{\mathrm{màx}} = \dfrac{U^2}{R_{\mathrm{mín}}} = 2{,}597\ \mathrm{kW}$

d) $t = 1\dfrac{\mathrm{h}}{\mathrm{dia}}\,30\dfrac{\mathrm{dies}}{\mathrm{mes}};\ \rightarrow\ c = p\ t\ P_{\mathrm{màx}} = 11{,}69\ €$

SÈRIE 3

Exercici 1

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

Exercici 2

a)

x_1	x_2	x_3	c
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

b)

$$c = (\overline{x_1} \cdot \overline{x_2} \cdot \overline{x_3}) + (\overline{x_1} \cdot x_2 \cdot \overline{x_3}) + (x_1 \cdot \overline{x_2} \cdot x_3) + (x_1 \cdot x_2 \cdot x_3)$$

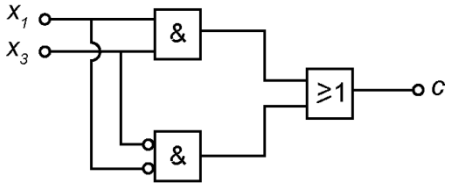
o també

$$c = (x_1 + x_2 + \overline{x_3}) \cdot (x_1 + \overline{x_2} + \overline{x_3}) \cdot (\overline{x_1} + x_2 + x_3) \cdot (\overline{x_1} + \overline{x_2} + x_3)$$

simplificant:

$$c = x_1 \cdot x_3 + \overline{x_1} \cdot \overline{x_3}$$

c)



Exercici 3

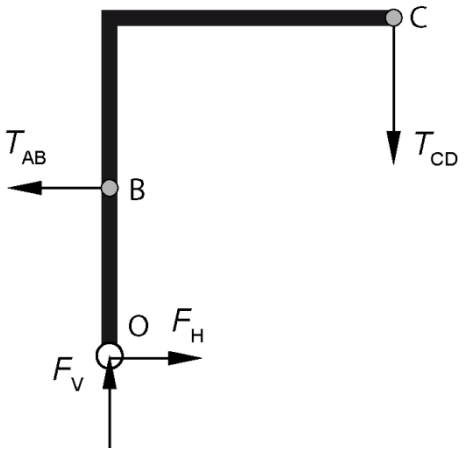
a) $m_2\ g\ L = m_3\ g\ 2L \rightarrow m_3 = m_2/2 = 0{,}1$ kg

$m_4\ g\ 3L = (m_2 + m_3)\ g\ 2L \rightarrow m_4 = 2(m_2 + m_3)/3 = 0{,}2$ kg

$m_1\ g\ 3L = (m_2 + m_3 + m_4)\ g\ 4L \rightarrow m_1 = 4(m_2 + m_3 + m_4)/3 = \frac{2}{3}$ kg

$T_{\text{CD}} = \sum m_i\ g = 11{,}44$ N

b)



c) $\sum M(\text{O}) = 0 \rightarrow T_{\text{AB}}\ 5L - T_{\text{CD}}\ 8L = 0 \rightarrow T_{\text{AB}} = 8\,T_{\text{CD}}/5 = 18{,}31$ N

d) $\sum F_{\text{horitzontals}} = 0 \rightarrow F_{\text{H}} = T_{\text{AB}} = 18{,}31$ N

$\sum F_{\text{verticals}} = 0 \rightarrow F_{\text{V}} = T_{\text{CD}} = 11{,}44$ N

Exercici 4

a) $E_{útil} = \frac{1}{2}m(v_2^2 - v_1^2)$; $P_{\text{útil}} = \frac{E_{útil}}{t} = 73{,}81$ kW

b) $E_{\text{cons}} = \frac{E_{útil}}{\eta} = 1273$ kJ

c) $V = \frac{E_{\text{cons}}}{p \cdot \rho} = 38{,}44\ \text{cm}^3$

Exercici 5

a) $P_{\text{cons}} = \dfrac{P_{\text{mec}}}{\eta}$; $P_{\text{mec}} = m \cdot g \cdot v \sin(\alpha_1)$; $P_{\text{cons}} = 334{,}0$ W

b) $E_{\text{bat}} = c \cdot U = 888$ W·h $= 3197$ kJ

c) $t = \dfrac{E_{\text{bat}}}{P_{\text{cons}}} = 2{,}659$ h; $s_1 = v \cdot t = 13{,}29$ km

d) $s_2 = s_1 \dfrac{\sin(6)}{\sin(10)} = 8{,}003$ km ; $\Delta s = |s_2 - s_1| = 5{,}292$ km

Exercici 6

a) $t = 4\dfrac{\text{h}}{\text{dia}} \cdot 170\dfrac{\text{dies}}{\text{any}}$; $E_{\text{subm}} = P_{\text{subm}} \cdot t = 1195$ MW·h $= 4{,}304 \cdot 10^{12}$ J

$E_{\text{cons}} = \dfrac{E_{\text{subm}}}{\eta_{\text{c}}} = 1314$ MW·h $= 4{,}729 \cdot 10^{12}$ J

b) $V = \dfrac{E_{\text{cons}}}{p_c \cdot \rho_{\text{gasoil}}} = 124{,}2\text{m}^3$

c) $c_{\text{tot}} = c_{\text{gasoil}} \cdot V = 110{,}9$ k€

d) $m_{\text{CO2}} = FE \cdot V = 346{,}5 \cdot 10^3$ kg