



SÈRIE 1

Primera part

Exercici 1

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

Exercici 2

a)

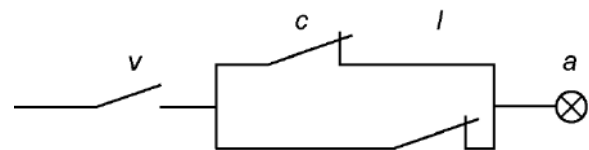
v	c	l	a
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

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

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

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

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

Exercici 4

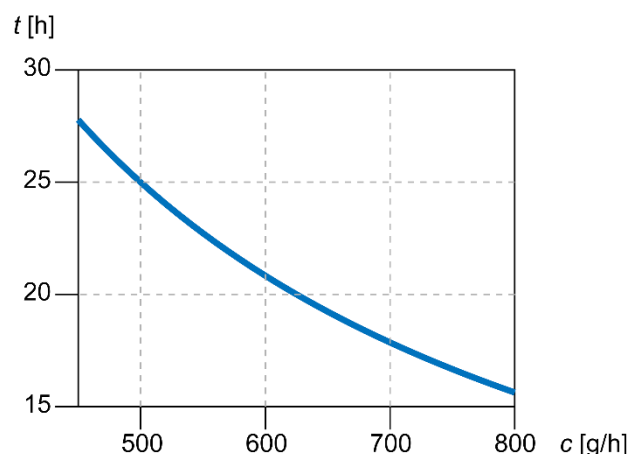
a) $P_{\text{mín}} = p_b c_{\text{mín}} = 6,201 \text{ kW}$

$P_{\text{màx}} = p_b c_{\text{màx}} = 11,02 \text{ kW}$

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

d) $m_{\text{CO}_2} = c_{\text{màx}} n t_{\text{bar}} FE = 71,04 \text{ kg}$

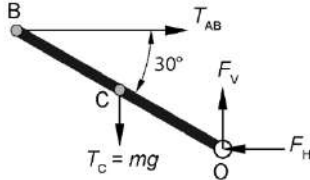
c)





Exercici 5

a)



b)

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

c)

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

$$\text{d) } \sum F_{\text{horizontals}} = 0 \rightarrow F_H = T_{AB} \rightarrow F_H = 254,8 \text{ N}$$

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

e)

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

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

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

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

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

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

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



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)

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

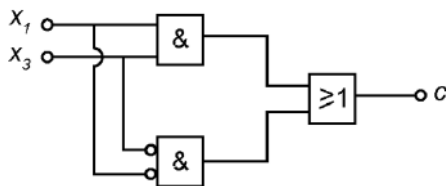
o també

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

simplificant:

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

c)





Exercici 3

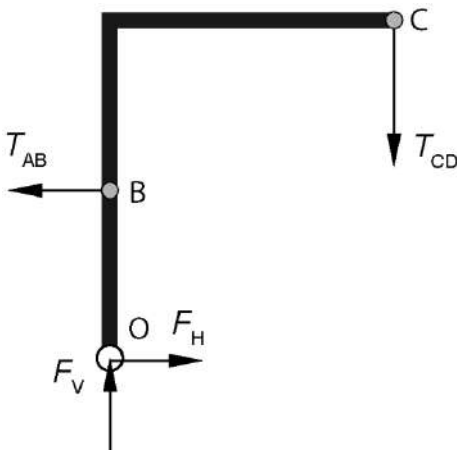
a) $m_2 g L = m_3 g 2L \rightarrow m_3 = m_2/2 = 0,1 \text{ kg}$

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

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

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

b)



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

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

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

Exercici 4

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

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

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



Exercici 5

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

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

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

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

Exercici 6

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

$$E_{\text{cons}} = \frac{E_{\text{subm}}}{\eta_c} = 1314 \text{ MW}\cdot\text{h} = 4,729 \cdot 10^{12} \text{ J}$$

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

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

$$\text{d) } m_{\text{CO}_2} = FE \cdot V = 346,5 \cdot 10^3 \text{ kg}$$