

SÈRIE 1**Primera part****Exercici 1**

Q1 c Q2 c Q3 d Q4 a Q5 b

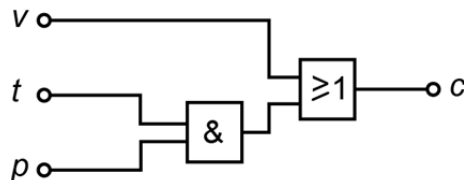
Exercici 2

a)

v	t	p	c
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

b) $c = \bar{v} \cdot t \cdot p + v \cdot \bar{t} \cdot \bar{p} + v \cdot \bar{t} \cdot p + v \cdot t \cdot \bar{p} + v \cdot t \cdot p \Rightarrow c = v + t \cdot p$

c)

**Segona part****OPCIÓ A****Exercici 3**

a) Calen $n_T = 12$ triangles equilàters $\rightarrow p_T = n_T \cdot 3 b = 10,8$ m

b) Calen $n_R = 6$ rombes $\rightarrow p_R = n_R \cdot 4 b = 7,2$ m

c) $p_E = 12 b = 3,6$ m

d) $s = 12 \frac{\sqrt{3} b^2}{4} = 0,4677$ m²

OPCIÓ T: $c_T = 15 \cdot 0,4677 + 0,6 \cdot 10,8 = 13,49$ €

OPCIÓ R: $c_R = 15 \cdot 0,4677 + 0,6 \cdot 7,2 = 11,33$ €

OPCIÓ E: $c_E = 15 \cdot 0,4677 + 1,4 \cdot 3,6 = 12,05$ €

L'opció R, és a dir, fabricar l'estrella mitjançant rombes, és la més econòmica.

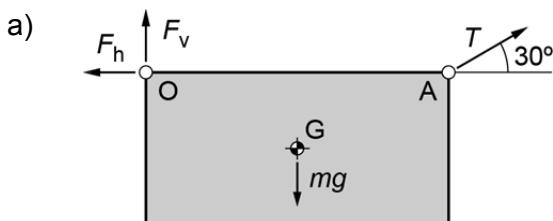
Exercici 4

$$a) P_{\text{càrrega}} = \frac{m g \Delta h}{t} = 2043 \text{ W}$$

$$b) \eta_{\text{red}} = \frac{P_{\text{càrrega}}}{P_m} \Rightarrow P_m = \frac{P_{\text{càrrega}}}{\eta_{\text{red}}} = 2919 \text{ W}; \quad T_m = \frac{P_m}{n \left(\frac{2\pi}{60} \right)} = 18,58 \text{ Nm}$$

$$c) \eta_{\text{mot}} = \frac{P_m}{P_{\text{elèc}}} \Rightarrow P_{\text{elèc}} = \frac{P_m}{\eta_{\text{mot}}} = 3742 \text{ W}; \quad I = \frac{P_{\text{elèc}}}{U} = 17,01 \text{ A}$$

$$d) P_{\text{dis}} = P_{\text{elèc}} - P_{\text{càrrega}} = P_{\text{elèc}} (1 - \eta_{\text{mot}} \eta_{\text{red}}) = 1699 \text{ W}$$

OPCIÓ B**Exercici 3**

$$b) m = V \rho_{\text{alumini}} = 2 L^2 e \rho_{\text{alumini}} = 27,10 \text{ kg}$$

$$c) \sum F_{\text{horizontals}} = 0 \rightarrow F_h = T \cos 30^\circ$$

$$\sum F_{\text{verticals}} = 0 \rightarrow F_v + T \sin 30^\circ = mg$$

$$\sum M(A) = 0 \rightarrow F_v 2L = mg L$$

Resolent el sistema lineal anterior, s'arriba a la següent solució:

$$F_v = mg/2 = 132,9 \text{ N}, \quad T = mg = 265,8 \text{ N}, \quad F_h = \sqrt{3} mg / 2 = 230,2 \text{ N}$$

$$d) \sigma = \frac{T}{\frac{\pi d^2}{4}} = 84,60 \text{ MPa}; \quad \sigma = E_{\text{acer}} \varepsilon \Rightarrow \varepsilon = \frac{\sigma}{E_{\text{acer}}} = 0,0004087 = 0,04087\%$$

Com que $\sigma < \sigma_{e,\text{acer}}$, el cable no s'arriba a deformar plàsticament.

Exercici 4

$$a) R = \frac{U_{\text{bateries}} - 5 U_{\text{LED}}}{3 I_{\text{LED},4}} = \frac{4 U_{\text{bat}} - 5 U_{\text{LED}}}{3 I_{\text{LED},4}} = 413,3 \Omega$$

$$b) P_{\text{total}} = U_{\text{bateries}} \cdot 3 I_{\text{LED},4} = 4 U_{\text{bat}} \cdot 3 I_{\text{LED},4} = 3,600 \text{ W} \Rightarrow E_{\text{total}} = P_{\text{total}} t = 103,7 \text{ kJ} = 28,80 \text{ Wh}$$

$$c) t_{\text{bat},4} = \frac{C_{\text{bat}}}{3 I_{\text{LED},4}} = 133,3 \text{ h}$$

$$d) I_{\text{LED},3} = \frac{U_{\text{bateries}} - 5 U_{\text{LED}}}{3 R} = \frac{3 U_{\text{bat}} - 5 U_{\text{LED}}}{3 R} = 0,01532 \text{ A} = 15,32 \text{ mA}$$

$$e) t_{\text{bat},3} = \frac{C_{\text{bat}}}{3 I_{\text{LED},3}} = 217,5 \text{ h}$$

SÈRIE 5

Primera part

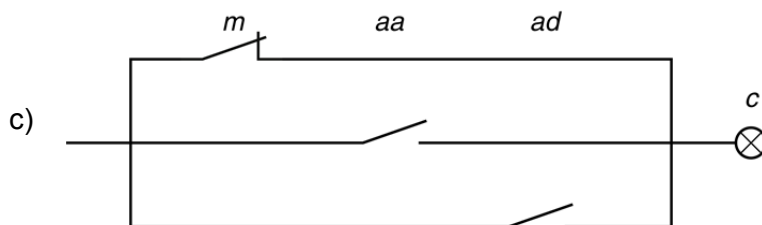
Exercici 1

Q1 b Q2 a Q3 c Q4 c Q5 a

Exercici 2

m	aa	ad	c
0	0	0	1
0	0	1	1
0	1	0	1
a) 0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

$$b) \quad c = \overline{m \cdot aa \cdot ad} = \bar{m} + aa + ad$$



Segona part

OPCIÓ A

Exercici 3

$$a) \quad L_P = h + 2b + \pi r = 1,548 \text{ m} \quad L_A = 2 \frac{h}{\cos(\alpha/2)} + 2b = 1,666 \text{ m} \quad L_U = 2(h - r) + \pi r = 1,588 \text{ m}$$

$$b) \quad P_P = P_{\text{tub}} L_P = 92,90 \text{ W} \quad P_A = P_{\text{tub}} L_A = 99,96 \text{ W} \quad P_U = P_{\text{tub}} L_U = 95,30 \text{ W}$$

$$c) \quad \text{opció 1} \quad t_{\text{cicle1}} = 2 \cdot 3 = 6 \text{ s} \quad E_{\text{cicle1}} = (P_P + P_A + P_U) 2 \text{ s} = 576,3 \text{ J}$$

$$E_1 = E_{\text{cicle1}} \frac{3 \cdot 3600 \text{ s}}{t_{\text{cicle1}}} = 1,037 \text{ MJ} = 0,2882 \text{ kWh}$$

$$\text{opció 2} \quad t_{\text{cicle2}} = 2 \cdot 4 = 8 \text{ s} \quad E_{\text{cicle2}} = (P_P + 2P_A + P_U) 2 \text{ s} = 776,2 \text{ J}$$

$$E_2 = E_{\text{cicle2}} \frac{3 \cdot 3600 \text{ s}}{t_{\text{cicle2}}} = 1,048 \text{ MJ} = 0,2911 \text{ kWh}$$

Exercici 4

$$a) P_{\text{mec}} = m_c g v_{\text{cab}} - m_{\text{cp}} g v_{\text{cp}} = (m_c - 2m_{\text{cp}}) g v_{\text{cab}} = 784,6 \text{ W}$$

$$b) \eta = \frac{P_{\text{mec}}}{P_{\text{elèctr}}} \Rightarrow P_{\text{elèctr}} = \frac{P_{\text{mec}}}{\eta} = 956,8 \text{ W}$$

$$c) P_{\text{mec}} = 0 = (m_c - 2m_{\text{cp}}) g v_{\text{cab}} \Rightarrow m_c = 2m_{\text{cp}} = 240 \text{ kg}$$

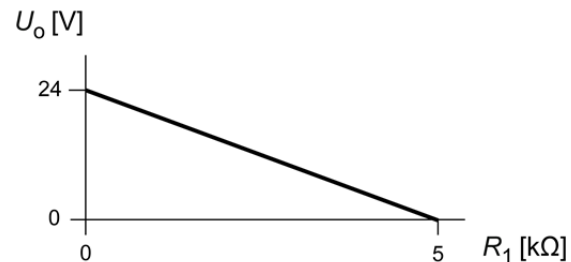
$$d) F_{\text{cinta}} = \frac{m_c g}{6} = 523,0 \text{ N} \Rightarrow \sigma_n = \frac{F_{\text{cinta}}}{s} = 6,974 \text{ N/mm}^2 = 6,974 \text{ MPa}$$

OPCIÓ B**Exercici 3**

$$a) I = \frac{U_i}{R} = 4,8 \text{ mA}$$

$$b) U_o = I R_2 = I (R - R_1) = 14,4 \text{ V}$$

$$c) U_o = \frac{U_i}{R} (R - R_1) \quad \rightarrow$$



$$d) k = \frac{|\Delta U_o|}{|\Delta d|} = \frac{(24 - 0) \text{ V}}{(1200 - 150) \text{ mm}} = 0,02286 \text{ V/mm}$$

Exercici 4

$$a) P_{\text{cons}} = \frac{p \rho V}{t} = \frac{32,1 \cdot 0,423 \cdot 10^3 \cdot 4515}{24 \cdot 3600} = 709,6 \text{ MW}$$

$$b) \eta = \frac{P_{\text{elèctr}}}{P_{\text{cons}}} = 0,5496$$

c)

$$\left. \begin{aligned} \eta &= \frac{P_{\text{elèctr}}}{P_{\text{cons}}} = \frac{P_{\text{cg}} + P_{\text{cv}}}{P_{\text{cons}}} \\ \eta_g &= \frac{P_{\text{cg}}}{P_{\text{cons}}} \\ \eta_v &= \frac{P_{\text{cv}}}{P_{\text{diss cg}}} = \frac{P_{\text{cv}}}{(1 - \eta_g) P_{\text{cons}}} \end{aligned} \right\} \Rightarrow \eta = \eta_g + \eta_v (1 - \eta_g) \Rightarrow \eta_g = \frac{\eta - \eta_v}{1 - \eta_v} = 0,3473$$