SÈRIE 1

Primera part

Exercici 1

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

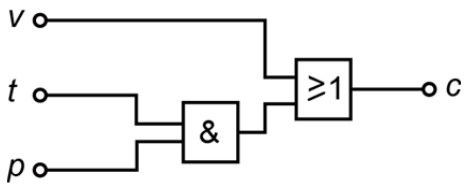
Exercici 2

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 → $p_T = n_T \cdot 3\, b = 10{,}8$ m

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

c) $p_E = 12\, b = 3{,}6$ m

d) $s = 12\, \dfrac{\sqrt{3}\, b^2}{4} = 0{,}4677\ \text{m}^2$

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

b) $\eta_{\text{red}} = \dfrac{P_{\text{càrrega}}}{P_{\text{m}}} \implies P_{\text{m}} = \dfrac{P_{\text{càrrega}}}{\eta_{\text{red}}} = 2919$ W; $\Gamma_{\text{m}} = \dfrac{P_{\text{m}}}{n\left(\frac{2\pi}{60}\right)} = 18{,}58$ Nm

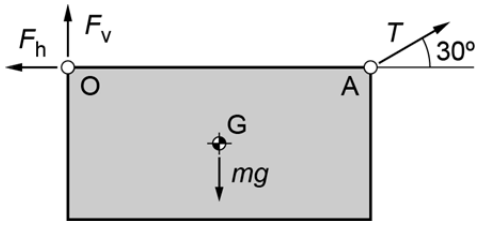
c) $\eta_{\text{mot}} = \dfrac{P_{\text{m}}}{P_{\text{elèc}}} \implies P_{\text{elèc}} = \dfrac{P_{\text{m}}}{\eta_{\text{mot}}} = 3742$ W; $I = \dfrac{P_{\text{elèc}}}{U} = 17{,}01$ A

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

OPCIÓ B

Exercici 3

a)



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

c) $\sum F_{\text{horitzontals}} = 0 \;\rightarrow\; F_{\text{h}} = T\cos 30º$

$\sum F_{\text{verticals}} = 0 \;\rightarrow\; F_{\text{v}} + T\sin 30º = mg$

$\sum M(\text{A}) = 0 \;\rightarrow\; F_{\text{v}}\,2L = mg\,L$

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

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

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

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

Exercici 4

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

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

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

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

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

SÈRIE 5

Primera part

Exercici 1

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

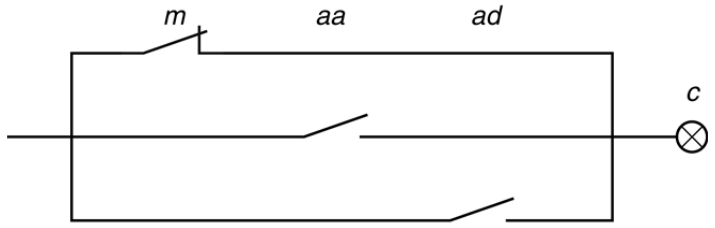
Exercici 2

a)

m	*aa*	*ad*	*c*
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

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

c)



Segona part

OPCIÓ A

Exercici 3

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

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

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

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

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

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

Exercici 4

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

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

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

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

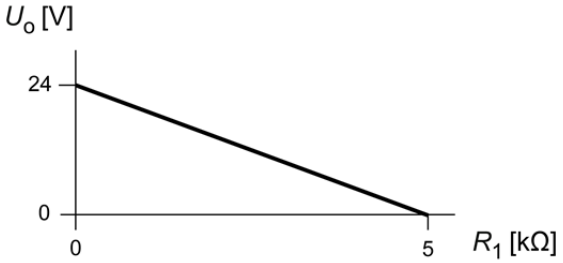
OPCIÓ B

Exercici 3

a) $I = \dfrac{U_{\text{i}}}{R} = 4{,}8 \text{ mA}$

b) $U_{\text{o}} = I\, R_2 = I\left(R - R_1\right) = 14{,}4 \text{ V}$

c) $U_{\text{o}} = \dfrac{U_{\text{i}}}{R}\left(R - R_1\right) \quad \rightarrow$



d) $k = \dfrac{\left|\Delta U_{\text{o}}\right|}{\left|\Delta d\right|} = \dfrac{(24 - 0) \text{ V}}{(1200 - 150) \text{ mm}} = 0{,}02286 \text{ V/mm}$

Exercici 4

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

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

c)

$$\left.\begin{array}{r} \eta = \dfrac{P_{\text{elèctr}}}{P_{\text{cons}}} = \dfrac{P_{\text{cg}} + P_{\text{cv}}}{P_{\text{cons}}} \\ \eta_{\text{g}} = \dfrac{P_{\text{cg}}}{P_{\text{cons}}} \\ \eta_{\text{v}} = \dfrac{P_{\text{cv}}}{P_{\text{diss cg}}} = \dfrac{P_{\text{cv}}}{\left(1 - \eta_{\text{g}}\right) P_{\text{cons}}} \end{array}\right\} \quad \Rightarrow \quad \eta = \eta_{\text{g}} + \eta_{\text{v}}\left(1 - \eta_{\text{g}}\right) \quad \Rightarrow \quad \eta_{\text{g}} = \frac{\eta - \eta_{\text{v}}}{1 - \eta_{\text{v}}} = 0{,}3473$$