SÈRIE 3

Primera part

Exercici 1

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

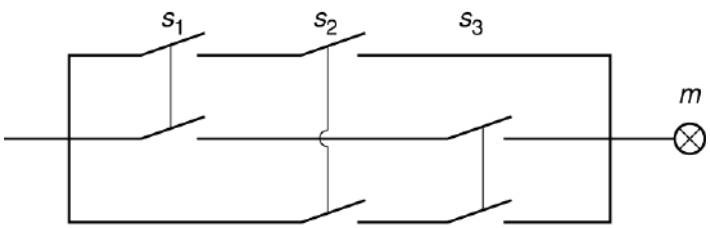
Exercici 2

a)

s_1	s_2	s_3	m
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

b)
$$m = \bar{s}_1 \cdot s_2 \cdot s_3 + s_1 \cdot \bar{s}_2 \cdot s_3 + s_1 \cdot s_2 \cdot \bar{s}_3 + s_1 \cdot s_2 \cdot s_3$$
$$m = s_1 \cdot s_2 + s_1 \cdot s_3 + s_2 \cdot s_3$$

c)



Segona part

OPCIÓ A

Exercici 3

a) $E_1 = V\,\rho\, c_e\,(T_1 - T_0) = 0{,}5 \cdot 1 \cdot 4{,}18 \cdot 10^3 (120 - 20) = 209{,}0 \text{ kJ} = 58{,}06 \text{ Wh}$

b) $E_1 = P_1\, t_1 \quad \Rightarrow \quad t_1 = E_1 / P_1 = 298{,}6 \text{ s}$

c) $P = \dfrac{U^2}{R} \quad \Rightarrow \quad R_e = \dfrac{U^2}{P_1} = 75{,}57\ \Omega$

$$R_e + R_m = \frac{U^2}{P_2} \quad \Rightarrow \quad R_m = \frac{U^2}{P_2} - R_e = 127{,}9\ \Omega$$

Exercici 4

a) $\omega_{\text{roda}} = \dfrac{v}{r} = 15{,}15 \text{ rad/s}$ $\qquad$ $\omega_{\text{pedals}} = \dfrac{\omega_{\text{roda}}}{\tau} = 8{,}418 \text{ rad/s}$

b) $P_{\text{bici}} = m\,g\,v \sin\alpha = 887{,}0 \text{ W}$

c) $\eta = \dfrac{P_{\text{bici}}}{P_{\text{pedals}}} \quad \Rightarrow \quad P_{\text{pedals}} = \dfrac{P_{\text{bici}}}{\eta} = 933{,}6 \text{ W}$

d) $\Gamma_{\text{pedals}} = \dfrac{P_{\text{pedals}}}{\omega_{\text{pedals}}} = 110{,}9 \text{ Nm}$

OPCIÓ B

Exercici 3

a) Si el vol construir a base de quadrats (*b*x*b*) cal utilitzar el tauler de gruix 12 mm ja que l'alçada *h* només és divisible per 12 mm. $\Rightarrow$ $n_1 = h/e_1 = 25$ quadrats necessaris.

Si el vol construir a base de rectangles (*h*x*b*) cal utilitzar el tauler de gruix 14 mm ja que la longitud *b* només és divisible per 14 mm. $\Rightarrow$ $n_2 = b/e_2 = 10$ rectangles necessaris.

b) $p_1 = 4\,b\,n_1 = 4\,b\,\dfrac{h}{e_1} = 14 \text{ m}$ $\qquad$ $p_2 = 2(b+h)\,n_2 = 2(b+h)\,\dfrac{b}{e_2} = 8{,}8 \text{ m}$

c) $s_1 = b^2\,n_1 = b^2\,\dfrac{h}{e_1} = 0{,}49 \text{ m}^2$ $\qquad$ $s_2 = b\,h\,n_2 = b\,h\,\dfrac{b}{e_2} = 0{,}42 \text{ m}^2$

d) $c_1 = c_{\text{a}}\,p_1 + c_{\text{b1}}\,s_1 = 11{,}37 \text{ €}$ $\qquad$ $c_2 = c_{\text{a}}\,p_2 + c_{\text{b2}}\,s_2 = 8{,}18 \text{ €}$

És més econòmic construir-lo a base de rectangles.

Exercici 4

a) $\sum F_{\text{verticals}} = 0 \quad \rightarrow \quad 2F_{\text{ch}} = m\,\text{g} \quad \rightarrow \quad F_{\text{ch}} = \dfrac{m\,\text{g}}{2}$

$$p_{\text{int}} = \frac{F_{\text{ch}}}{s_{\text{int}}} = \frac{m\,\text{g}}{2\,s_{\text{int}}} \quad \Rightarrow \quad m = \frac{2\,p_{\text{int}}\,s_{\text{int}}}{\text{g}} = \frac{2\,p_{\text{int}}\,\pi\left(\dfrac{d_{\text{int}}}{2}\right)^2}{\text{g}} = 4004 \text{ kg}$$

b) $\sigma_{\text{tija}} = \dfrac{F_{\text{ch}}}{s_{\text{tija}}} = \dfrac{m\,\text{g}}{2\,s_{\text{tija}}} = \dfrac{m\,\text{g}}{2\,\pi\left(\dfrac{d_{\text{tija}}}{2}\right)^2} = 7{,}972 \text{ MPa}$

c) $\eta = \dfrac{F_{\text{ch}}\,v}{P_{\text{h}}} = \dfrac{m\,\text{g}\,v}{2\,P_{\text{h}}} \quad \Rightarrow \quad P_{\text{h}} = \dfrac{m\,\text{g}\,v}{2\,\eta} = 847{,}9 \text{ W}$

d) $P_{\text{h}} = p\,q \quad \Rightarrow \quad p = \dfrac{P_{\text{h}}}{q} = 2{,}840 \text{ MPa}$

SÈRIE 5

Primera part

Exercici 1

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

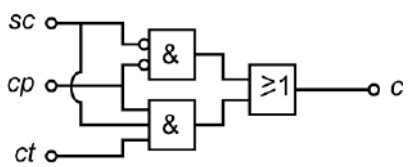
Exercici 2

a)

sc	cp	ct	c
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

b)
$$c = \overline{sc} \cdot \overline{cp} \cdot \overline{ct} + \overline{sc} \cdot \overline{cp} \cdot ct + sc \cdot cp \cdot ct$$
$$c = \overline{sc} \cdot \overline{cp} + sc \cdot cp \cdot ct$$

c)



Segona part

OPCIÓ A

Exercici 3

a) $I = \dfrac{P}{U} = 9{,}565 \text{ A}$

b) $R = \dfrac{U^2}{P} = \dfrac{\rho L}{S} = \dfrac{4\rho L}{\pi d^2} \Rightarrow L = \dfrac{U^2 \pi d^2}{4 P \rho} \Rightarrow \begin{cases} L_{0,125} = 0{,}6022 \text{ m} \\ L_{0,25} = 2{,}409 \text{ m} \\ L_{0,5} = 9{,}635 \text{ m} \end{cases}$

c) $S = L \cdot 200 d \Rightarrow \begin{cases} S_{0,125} = 0{,}01506 \text{ m}^2 \\ S_{0,25} = 0{,}1204 \text{ m}^2 \approx 0{,}3 \cdot 0{,}4 = 0{,}12 \text{ m}^2 \\ S_{0,5} = 0{,}9635 \text{ m}^2 \end{cases} \Rightarrow$ opció adequada

$\text{cost} = L_{0,25} \cdot 1{,}29 \text{ €/m} = 3{,}107 \text{ €}$

Exercici 4

a) $I_{sc} = 6{,}54\left(1 - \exp\left(\frac{0 - 21{,}6}{1{,}556}\right)\right) = 6{,}540\ \text{A}$

b) $I = 0 = 6{,}54\left(1 - \exp\left(\frac{U_{oc} - 21{,}6}{1{,}556}\right)\right) \Rightarrow 1 = \exp\left(\frac{U_{oc} - 21{,}6}{1{,}556}\right) \Rightarrow \ln(1) = 0 = \frac{U_{oc} - 21{,}6}{1{,}556}$

$\Rightarrow U_{oc} = 21{,}6\ \text{V}$

c) $I_{màx} = 6{,}54\left(1 - \exp\left(\frac{U_{màx} - 21{,}6}{1{,}556}\right)\right) = 6{,}100\ \text{A}$

$P_{màx} = U_{màx} I_{màx} = 17{,}4 \cdot 6{,}100 = 106{,}1\text{W}$

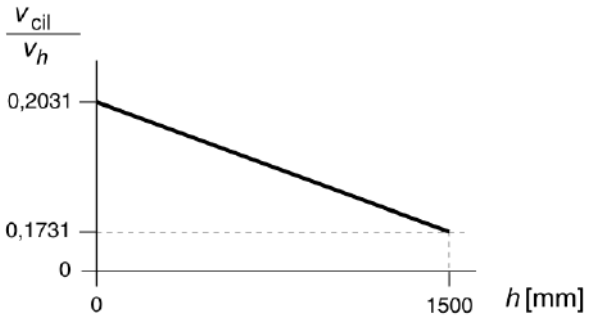
d) 2 grups en paral·lel $\Rightarrow I_{cel\cdot la} = \frac{I_{màx}}{2} = 3{,}05\,\text{A}$

36 cel·les en sèrie $\Rightarrow U_{cel\cdot la} = \frac{U_{màx}}{36} = 0{,}4833\,\text{V}$

OPCIÓ B

Exercici 3

a)



b) La potència d'elevació de la càrrega la proporcionen els cilindres:

$$P_{cil} = 2F_{cil}v_{cil} = m\,g\,v_h \quad \rightarrow \quad F_{cil} = \frac{m\,g}{2}\frac{v_h}{v_{cil}} = \frac{m\,g}{2}\frac{50000}{10155 - h} = \frac{1800 \cdot 9{,}807}{2}\frac{50000}{10155 - 1100} = 48{,}74\,\text{kN}$$

c) $p_{int} = \frac{F_{cil}}{\pi\left(d_{int}/2\right)^2} = 5{,}128\,\text{MPa}$

Exercici 4

a) $E_{\text{dia}} = c\,\rho\,c_{\text{e}}\,\Delta T = 240 \cdot 1 \cdot 4{,}18 \cdot 10^3 (45 - 10) = 35{,}11\ \text{MJ}$

$I_{\text{dia}} = \dfrac{E_{\text{dia}}}{S} =$ 15,96 MJ/m^2

b) $I = \dfrac{I_{\text{dia}}}{3} =$ 5,32 MJ/m^2 $\Rightarrow$ $S_{\text{necessària}} = \dfrac{0{,}60\,E_{\text{dia}}}{I} = 3{,}96$ m^2

$\dfrac{S_{\text{necessària}}}{S} =$ 1,8 $\Rightarrow$ es necessiten 2 captadors

c) $E_{\text{solar}} = 2\,S\,I = 2 \cdot 2{,}2 \cdot 5{,}32 = 23{,}41\ \text{MJ}$

$E_{\text{elèctr}} = E_{\text{dia}} - E_{\text{solar}} = 11{,}70\ \text{MJ} = 3{,}25$ kW h