SÈRIE 1

Primera part

Exercici 1

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

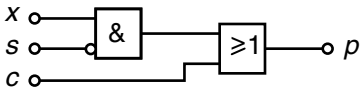
Exercici 2

a)

x	s	c	p
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

b) $p = \overline{x}\cdot\overline{s}\cdot c + \overline{x}\cdot s\cdot c + x\cdot\overline{s}\cdot\overline{c} + x\cdot\overline{s}\cdot c + x\cdot s\cdot c = c + x\cdot\overline{s}$

c)



Segona part

OPCIÓ A

Exercici 3

a) $\Gamma_m = \dfrac{P_m}{\omega} = \dfrac{39}{3000\dfrac{2\pi}{60}} = 0{,}1241\,\text{Nm}$

b) $E_m = P_m\, t = 39\cdot\dfrac{30}{60} = 19{,}5\,\text{W h} = 70{,}2\,\text{kJ} \quad\Rightarrow\quad E_{motor} = \dfrac{E_m}{\eta} = 32{,}5\,\text{W h} = 117\,\text{kJ}$

$E_{dis\ motor} = E_{motor} - E_m = 13\,\text{W h} = 46{,}8\,\text{kJ}$

$E_{dis\ bat} = E_{bat} - E_{motor} = \dfrac{E_{motor}}{\eta_{bat}} - E_{motor} = 10{,}83\,\text{W h} = 39\,\text{kJ}$

c) $E_{bat} = \dfrac{E_{motor}}{\eta_{bat}} = 43{,}33\,\text{W h} = 156\,\text{kJ}$ $\qquad c = \dfrac{E_{bat}}{U} = 7{,}222\,\text{A h}$

Exercici 4

a) $\Delta l = l\ \alpha\ \Delta T = 1000 \cdot 12 \cdot 10^{-6} \cdot 30 = 0{,}36$ mm

b) $\sigma = \dfrac{E\ \Delta l'}{l} = \dfrac{203 \cdot 10^9 (0{,}36 - 2 \cdot 0{,}05)}{1000} = 52{,}78\,\text{MPa}$

c) $F = \sigma\ S = 52{,}78 \cdot \pi \cdot 60^2 / 4 = 149{,}2$ kN

OPCIÓ B

Exercici 3

a) $W_{\text{bomba}} = \eta\ E_{\text{elèc}} = 0{,}7 \cdot 5{,}6 = 3{,}92$ kW h $= 14{,}11$ MJ

b) $E_{\text{dis}} = E_{\text{elèc}} - W_{\text{bomba}} = 5{,}6 - 3{,}92 = 1{,}68$ kW h

$$P_{\text{h}} = \frac{W_{\text{bomba}}}{t} = \frac{3{,}92}{8} = 0{,}49\,\text{kW} = 490\,\text{W}$$

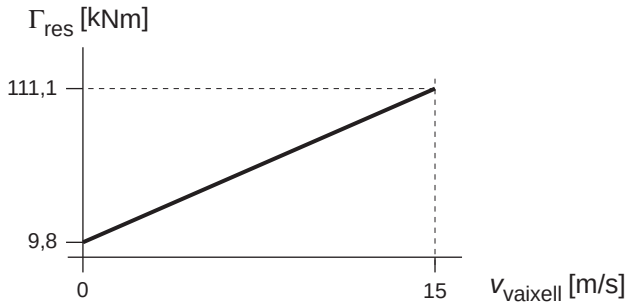
c) $$q = \frac{P_{\text{h}}}{\rho\ g\ h} = \frac{490}{1 \cdot 9{,}807 \cdot 3{,}5} = 14{,}28\,\text{l/s}$$

Exercici 4

a) $$\Gamma_{\text{m}} = \frac{P_{\text{m}}}{\omega} = \frac{6 \cdot 10^6}{750\,\frac{2\pi}{60}} = 76394\ \text{Nm} = 76{,}39\ \text{kNm}$$

b) $$\eta_{\text{m}} = \frac{E_{\text{motor}}}{E_{\text{combustible}}} = \frac{1}{c_{\text{e}}\ p_{\text{c}}} = 0{,}4798 \Rightarrow 47{,}98\%$$

c)



d) $\Gamma_{\text{m}} = \Gamma_{\text{res}} \Rightarrow 76394 = 9800 + 6750\ v_{\text{vaixell}} \Rightarrow v_{\text{vaixell}} = 9{,}866\,\text{m/s}$

SÈRIE 4

Primera part

Exercici 1

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

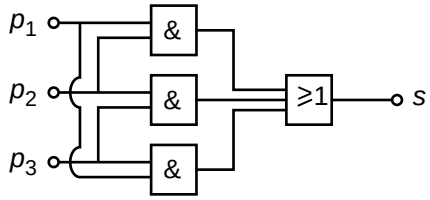
Exercici 2

a)

p_1	p_2	p_3	s
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)
$$s = \bar{p}_1 \cdot p_2 \cdot p_3 + p_1 \cdot \bar{p}_2 \cdot p_3 + p_1 \cdot p_2 \cdot \bar{p}_3 + p_1 \cdot p_2 \cdot p_3 = p_1 \cdot p_2 + p_2 \cdot p_3 + p_1 \cdot p_3$$

c)



Segona part

OPCIÓ A

Exercici 3

a) $I = \dfrac{P}{U} = 8{,}696 \text{ A}$

b) $R = \dfrac{\rho \cdot L}{S} = \dfrac{4\,\rho \cdot L}{\pi \cdot d^2} \Rightarrow d = \sqrt{\dfrac{4\,\rho \cdot L}{\pi R}} = \sqrt{\dfrac{4\,\rho \cdot L}{\pi}\dfrac{I^2}{P}} = 0{,}3365 \text{ mm}$

c) $E = P \cdot t\,\dfrac{100-5}{100} = 0{,}3167 \text{ kW h}; \qquad c_e = E \cdot c = 0{,}040 \text{ €}$

Exercici 4

a) $U_{oc} = 0{,}61\left(1+\frac{1}{16{,}2}\ln(1)\right) = 0{,}61\left(1+\frac{1}{16{,}2}0\right) = 0{,}61\ \text{V}$

b) $U_{\text{cel·la}} = 0{,}61\left(1+\frac{1}{16{,}2}\ln\left(\frac{8{,}36-7{,}79}{8{,}36}\right)\right) = 0{,}5089\ \text{V} \Rightarrow\ U_{\text{tot}} = 60\,U_{\text{cel·la}} = 30{,}53\ \text{V}$

c) $P_{\text{màx}} = U_{\text{tot}}\,I_{\text{màx}} = 30{,}53\cdot 7{,}79 = 237{,}8\,\text{W}$

d) $\left.\begin{array}{l} I' = 2I_{\text{màx}} \\ U' = 30U_{\text{cel·la}} \end{array}\right\} \Rightarrow\ P' = 30U_{\text{cel·la}}\,2I_{\text{màx}} = 237{,}8\,\text{W}$

La potència que subministra el panell no es modifica.

OPCIÓ B

Exercici 3

a) $\alpha = \arctan\frac{L_2}{L_3} = \arctan\frac{2}{5} = 21{,}80^\circ$

b) $\sum M(\text{O}) = 0 \ \Rightarrow\ \frac{L_1}{2}mg - L_2 F\cos\alpha = 0$

$F = mg\frac{L_1}{2L_2\cos\alpha} = 135\cdot 9{,}807\frac{10}{2\cdot 2\cdot\cos\alpha} = 3565\,\text{N}$

c) $F_{\text{H}} = F\cos\alpha = 3565\cos\alpha = 3310\,\text{N}$ (positiva cap a l'esquerra)

$F_{\text{V}} = mg + F\sin\alpha = 135\cdot 9{,}807 + 3565\sin\alpha = 2648\,\text{N}$ (positiva cap amunt)

Exercici 4

a) $m_{\text{a}} = q\cdot\rho\cdot t = 10\cdot 1\cdot 24\cdot 3600 = 864\cdot 10^3$ kg

$E_{\text{dia}} = m_{\text{a}}\,c_{\text{e}}\,\Delta T = 864\cdot 10^3\ 4{,}18\cdot 10^3(75-15) = 216{,}7\ \text{GJ} = 60192\ \text{kW h}$

b) $m_{\text{c}} = \frac{E_{\text{dia}}}{\eta p_{\text{c}}} = \frac{216{,}7\cdot 10^9}{0{,}63\cdot 23{,}6\cdot 10^6} = 14574$ kg

c) $m_{\text{b}} = \frac{E_{\text{dia}}}{\eta p_{\text{b}}} = \frac{216{,}7\cdot 10^9}{0{,}63\cdot 49{,}5\cdot 10^6} = 6949$ kg

d) carbó $\rightarrow$ $14574\cdot 2{,}30 = 33521$ kg de CO_2
butà $\rightarrow$ $6949\cdot 2{,}96 = 20568$ kg de CO_2 $\rightarrow$ produeix menys emissions