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)
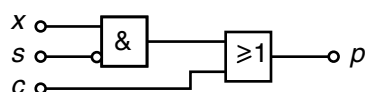
Segona part

OPCIÓ A

Exercici 3

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

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

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

$$P_{\text{h}} = \frac{W_{\text{bomba}}}{t} = \frac{3{,}92}{8} = 0{,}49\,\text{kW} = 490\,\text{W}$$
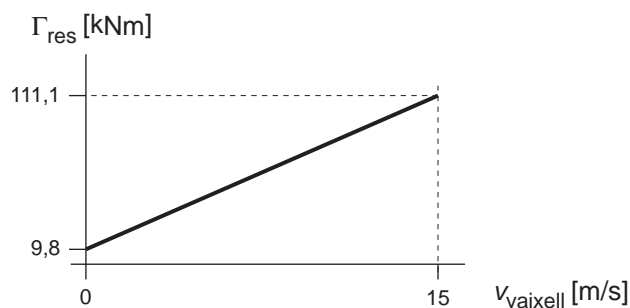
c) $q = \dfrac{P_{\text{h}}}{\rho\,g\,h} = \dfrac{490}{1 \cdot 9{,}807 \cdot 3{,}5} = 14{,}28$ l/s

Exercici 4

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

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

c)

d) $\Gamma_{\text{m}} = \Gamma_{\text{res}} \;\Rightarrow\; 76394 = 9800 + 6750\,v_{\text{vaixell}} \;\Rightarrow\; v_{\text{vaixell}} = 9{,}866\,\text{m/s}$
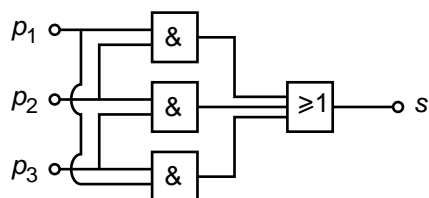
SÈRIE 4

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

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

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

Exercici 4

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

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

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

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

La potència que subministra el panell no es modifica.

OPCIÓ B

Exercici 3

a) $\alpha = \arctan\dfrac{L_2}{L_3} = \arctan\dfrac{2}{5} = 21,80°$

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

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

c) $F_H = F\cos\alpha = 3565\cos\alpha = 3310$ N (positiva cap a l'esquerra)

$F_V = mg + F\sin\alpha = 135\cdot 9,807 + 3565\sin\alpha = 2648$ N (positiva cap amunt)

Exercici 4

a) $m_a = q\cdot\rho\cdot t = 10\cdot 1\cdot 24\cdot 3600 = 864\cdot 10^3$ kg

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

b) $m_c = \dfrac{E_{\text{dia}}}{\eta\,p_c} = \dfrac{216,7\cdot 10^9}{0,63\cdot 23,6\cdot 10^6} = 14574$ kg

c) $m_b = \dfrac{E_{\text{dia}}}{\eta\,p_b} = \dfrac{216,7\cdot 10^9}{0,63\cdot 49,5\cdot 10^6} = 6949$ 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