

## SÈRIE 1

### Primera part

#### Exercici 1

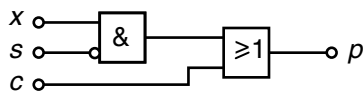
Q1 d      Q2 d      Q3 d      Q4 c      Q5 d

#### Exercici 2

$x$	$s$	$c$	$p$
0	0	0	0
0	0	1	1
0	1	0	0
a) 0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

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

c)



### Segona part

#### OPCIÓ A

#### Exercici 3

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

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

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

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

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

### Exercici 4

- a)  $\Delta l = l \alpha \Delta T = 1000 \cdot 12 \cdot 10^{-6} \cdot 30 = 0,36 \text{ mm}$
- b)  $\sigma = \frac{E \Delta l'}{l} = \frac{203 \cdot 10^9 (0,36 - 2 \cdot 0,05)}{1000} = 52,78 \text{ MPa}$
- c)  $F = \sigma S = 52,78 \cdot \pi \cdot 60^2 / 4 = 149,2 \text{ kN}$

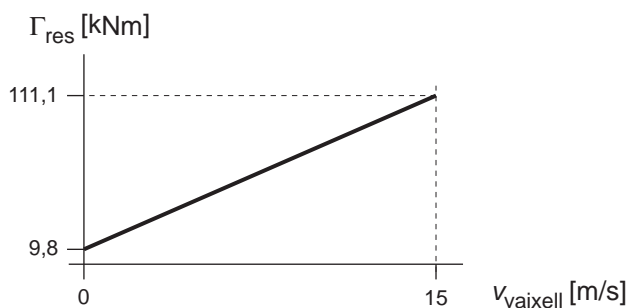
### OPCIÓ B

#### Exercici 3

- a)  $W_{\text{bomba}} = \eta E_{\text{elèc}} = 0,7 \cdot 5,6 = 3,92 \text{ kW h} = 14,11 \text{ MJ}$
- b)  $E_{\text{dis}} = E_{\text{elèc}} - W_{\text{bomba}} = 5,6 - 3,92 = 1,68 \text{ kW h}$
- $$P_h = \frac{W_{\text{bomba}}}{t} = \frac{3,92}{8} = 0,49 \text{ kW} = 490 \text{ W}$$
- c)  $q = \frac{P_h}{\rho g h} = \frac{490}{1 \cdot 9,807 \cdot 3,5} = 14,28 \text{ l/s}$

#### Exercici 4

- a)  $\Gamma_m = \frac{P_m}{\omega} = \frac{6 \cdot 10^6}{750 \frac{2\pi}{60}} = 76394 \text{ Nm} = 76,39 \text{ kNm}$
- b)  $\eta_m = \frac{E_{\text{motor}}}{E_{\text{combustible}}} = \frac{1}{c_e \rho_c} = 0,4798 \Rightarrow 47,98\%$
- c)



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

## SÈRIE 4

### Primera part

#### Exercici 1

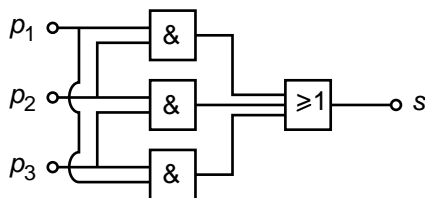
Q1 a      Q2 c      Q3 a      Q4 c      Q5 b

#### Exercici 2

$p_1$	$p_2$	$p_3$	$s$
0	0	0	0
0	0	1	0
0	1	0	0
a) 0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

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

c)



### Segona part

#### OPCIÓ A

#### Exercici 3

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

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

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

**Exercici 4**

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

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

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

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

La potència que subministra el panell no es modifica.

**OPCIÓ B****Exercici 3**

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

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

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

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

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

**Exercici 4**

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

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

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

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

$$d) \text{carbó} \rightarrow 14574 \cdot 2,30 = 33521 \text{ kg de CO}_2$$

$$\text{butà} \rightarrow 6949 \cdot 2,96 = 20568 \text{ kg de CO}_2 \rightarrow \text{ produeix menys emissions}$$