

Sèrie 1

Primera part

Exercici 1

Q1 b Q2 c Q3 a Q4 c Q5 d

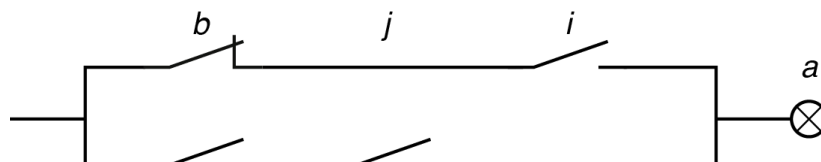
Exercici 2

a)

b	j	i	a
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

b) $a = \bar{b} \cdot \bar{j} \cdot i + \bar{b} \cdot j \cdot \bar{i} + b \cdot j \cdot \bar{i} + b \cdot j \cdot i \Rightarrow a = \bar{b} \cdot i + b \cdot j$

c)



Segona part

OPCIÓ A

Exercici 3

a) $\eta_A = 0,8 - 8,9 \cdot \frac{50 - 18}{800} = 0,444$; $\eta_B = 0,66 - 3,2 \cdot \frac{50 - 18}{800} = 0,532$

L'opció més eficient és triar el model de captador B.

b) $E_{\text{dia}} = c \rho c_e \Delta T = 57,06 \text{ MJ} = 15,85 \text{ kWh}$; $E_{\text{solar}} = \frac{E_{\text{dia}}}{\eta_B} = 107,3 \text{ MJ} = 29,79 \text{ kWh}$

$S_{\text{necessària}} = \frac{E_{\text{solar}}/t}{I} = 4,655 \text{ m}^2$; $\frac{S_{\text{necessària}}}{S} = 2,217 \Rightarrow$ Calen $n = 3$ captadors.

c) $\eta_B' = 0,66 - 3,2 \cdot \frac{50 - 18}{400} = 0,404$; $E_{\text{solar}} = n S I' t = 20,16 \text{ kWh}$

$E_{\text{tèrmica}} = \eta_B' E_{\text{solar}} = 8,145 \text{ kWh} \Rightarrow E_{\text{elèctr}} = E_{\text{dia}} - E_{\text{tèrmica}} = 7,705 \text{ kWh}$

Exercici 4

- a) $\omega_{\text{roda}} = \frac{v}{(d/2)} = 44,80 \text{ rad/s}; \quad \omega_{\text{motor}} = \frac{\omega_{\text{roda}}}{\tau} = 1018 \text{ rad/s}$
- b) $P_{\text{motor}} = \Gamma_{\text{motor}} \omega_{\text{motor}} = 6,109 \text{ kW}$
- c) $\eta_{\text{total}} = \eta_{\text{eng}} \eta_{\text{cad}} = \frac{P_{\text{roda}}}{P_{\text{motor}}} \Rightarrow P_{\text{roda}} = P_{\text{motor}} \eta_{\text{eng}} \eta_{\text{cad}} = 4,674 \text{ kW}$
- $$P_{\text{roda}} = P_{\text{mec}} = m g v \sin \alpha \Rightarrow \alpha = \arcsin\left(\frac{P_{\text{mec}}}{m g v}\right) = 13,22^\circ$$
- d) $P_{\text{roda}} = \Gamma_{\text{roda}} \omega_{\text{roda}} \Rightarrow \Gamma_{\text{roda}} = \frac{P_{\text{roda}}}{\omega_{\text{roda}}} = 104,3 \text{ Nm}$

OPCIÓ B**Exercici 3**

- a) $P_{\text{llum}} = \frac{U^2}{R} \Rightarrow R = \frac{U^2}{P_{\text{llum}}} = 2,618 \Omega; \quad R_{\text{eq}} = \frac{R}{2} = 1,309 \Omega$
- b) $I R_{\text{eq}} = 0,95 \cdot U \Rightarrow I = 8,708 \text{ A}; \quad I R_{\text{cable}} = 0,05 \cdot U \Rightarrow R_{\text{cable}} = 0,06890 \Omega$
- $$R_{\text{cable}} = \rho \frac{2L_{\text{màx}}}{S} = \rho \frac{2L_{\text{màx}}}{\pi(d^2/4)} \Rightarrow L_{\text{màx}} = 9,947 \text{ m}$$
- c) $R_{\text{cable}} = \rho \frac{2L}{\pi(d^2/4)} = 0,02771 \Omega$
- d) $P_{\text{total}} = \frac{U^2}{R_{\text{cable}} + R_{\text{eq}}} = 107,7 \text{ W}$

Exercici 4

- a) $\eta = \frac{P_{\text{elèctr}}}{P_{\text{cons}}} \Rightarrow P_{\text{cons}} = \frac{P_{\text{elèctr}}}{\eta} = 869,6 \text{ MW}$
- b) $P_{\text{cons}} = \frac{\rho \rho V}{t} \Rightarrow V = \frac{P_{\text{cons}} t}{\rho \rho} = 5465 \text{ m}^3$
- c) $P_{\text{diss cg}} = P_{\text{cons}}(1 - \eta_g) = 591,3 \text{ MW}$
- d) $\eta_v = \frac{P_{\text{cv}}}{P_{\text{diss cg}}} = \frac{P_{\text{elèctr}} - P_{\text{cg}}}{P_{\text{diss cg}}} = \frac{P_{\text{elèctr}} - P_{\text{cons}} \eta_g}{P_{\text{diss cg}}} = 0,3750$

SÈRIE 5

Primera part

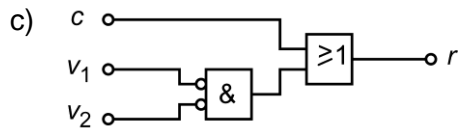
Exercici 1

Q1 c Q2 c Q3 a Q4 a Q5 a

Exercici 2

	c	v_1	v_2	r
	0	0	0	1
	0	0	1	0
	0	1	0	0
a)	0	1	1	0
	1	0	0	1
	1	0	1	1
	1	1	0	1
	1	1	1	1

$$\begin{aligned} \text{b) } r &= \bar{c} \cdot \bar{v}_1 \cdot \bar{v}_2 + c \cdot \bar{v}_1 \cdot \bar{v}_2 + c \cdot \bar{v}_1 \cdot v_2 + c \cdot v_1 \cdot \bar{v}_2 + c \cdot v_1 \cdot v_2 \\ &= c + \bar{v}_1 \cdot \bar{v}_2 \end{aligned}$$



Segona part**OPCIÓ A****Exercici 3**

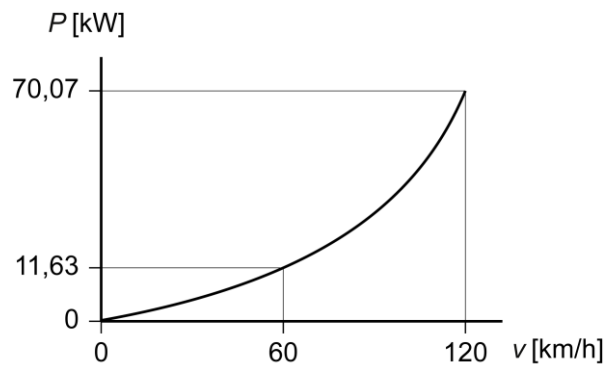
$$a) F_r = (230 + 0,13 \cdot 60^2) = 698 \text{ N}$$

$$b) P = F_r v = (230 + 0,13 v^2) \frac{v}{3,6}$$

$$P = (63,89 v + 0,03611 v^3)$$

amb v en km/h

$$c) \eta = \frac{P}{\Gamma \omega} \Rightarrow \Gamma = \frac{P}{\eta 2\pi n/60} = 55,55 \text{ Nm}$$

**Exercici 4**

$$a) P = \frac{U_1^2}{R_1} \Rightarrow R_1 = \frac{U_1^2}{P} = 14,4 \Omega$$

$$P = \frac{U_2^2}{R_1 + R_2} \Rightarrow R_2 = \frac{U_2^2}{P} - R_1 = 38,5 \Omega$$

$$b) I_1 = \frac{U_1}{R_1} = 8,333 \text{ A} \quad I_2 = \frac{U_2}{R_1 + R_2} = 4,348 \text{ A}$$

$$c) R_{2eq} = \frac{R_2 R_A}{R_2 + R_A} \Rightarrow P_e = \frac{U_1^2}{R_1 + R_{2eq}} = 838,0 \text{ W}$$

OPCIÓ B

Exercici 3

a) $m = \rho_{\text{fusta}} h b e = 3,148 \text{ kg}$

b) Pel conjunt dels dos taulers, la suma de forces en direcció vertical és nul·la.

$$\sum F_{\text{verticals}} = 0 \rightarrow 2N - 2mg = 0 \rightarrow N = mg = 30,87 \text{ N}$$

c) Per a un dels dos taulers:

$$\sum M(C) = 0 \rightarrow N h \sin\left(\frac{\alpha}{2}\right) - mg \frac{h}{2} \sin\left(\frac{\alpha}{2}\right) - 2F \frac{h}{2} \cos\left(\frac{\alpha}{2}\right) = 0 \rightarrow F = \frac{mg}{2} \tan\left(\frac{\alpha}{2}\right) = 5,619 \text{ N}$$

d) $\sigma = \frac{F}{s} = 3,121 \text{ MPa}$

Exercici 4

a) $d_{\text{màx}} = \frac{V \rho v}{c} = 6101 \text{ km}$

b) $c_p = 100 \text{ km} \frac{c}{v \rho N} = 2,732 \frac{\text{L}}{\text{passatger}}$ en 100 km

c) $P_{\text{mec}} = F_E v = 10153 \text{ kW}$

$$P_{\text{cons}} = \rho_c c = 31815 \text{ kW}$$

$$\Rightarrow \eta = \frac{P_{\text{mec}}}{P_{\text{cons}}} = 0,3191$$