Sèrie 1

Primera part

Exercici 1

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

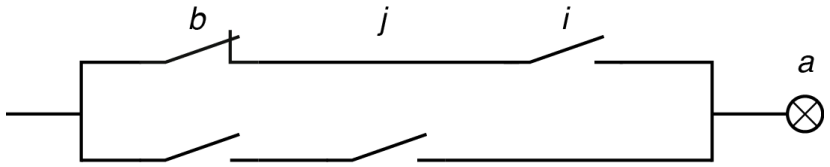
Exercici 2

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

c)



Segona part

OPCIÓ A

Exercici 3

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

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

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

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

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

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

Exercici 4

a) $\omega_{roda} = \dfrac{v}{(d/2)} = 44{,}80$ rad/s; $\omega_{motor} = \dfrac{\omega_{roda}}{\tau} = 1018$ rad/s

b) $P_{motor} = \Gamma_{motor}\,\omega_{motor} = 6{,}109$ kW

c) $\eta_{total} = \eta_{eng}\,\eta_{cad} = \dfrac{P_{roda}}{P_{motor}} \Rightarrow P_{roda} = P_{motor}\,\eta_{eng}\,\eta_{cad} = 4{,}674$ kW

$P_{roda} = P_{mec} = m\,g\,v\sin\alpha \Rightarrow \alpha = \arcsin\left(\dfrac{P_{mec}}{m\,g\,v}\right) = 13{,}22^{\circ}$

d) $P_{roda} = \Gamma_{roda}\,\omega_{roda} \Rightarrow \Gamma_{roda} = \dfrac{P_{roda}}{\omega_{roda}} = 104{,}3$ Nm

OPCIÓ B

Exercici 3

a) $P_{llum} = \dfrac{U^2}{R} \Rightarrow R = \dfrac{U^2}{P_{llum}} = 2{,}618\ \Omega$; $R_{eq} = \dfrac{R}{2} = 1{,}309\ \Omega$

b) $I\,R_{eq} = 0{,}95 \cdot U \Rightarrow I = 8{,}708$ A; $I\,R_{cable} = 0{,}05 \cdot U \Rightarrow R_{cable} = 0{,}06890\ \Omega$

$R_{cable} = \rho\,\dfrac{2L_{màx}}{S} = \rho\,\dfrac{2L_{màx}}{\pi(d^2/4)} \Rightarrow L_{màx} = 9{,}947$ m

c) $R_{cable} = \rho\,\dfrac{2L}{\pi(d^2/4)} = 0{,}02771\ \Omega$

d) $P_{total} = \dfrac{U^2}{R_{cable} + R_{eq}} = 107{,}7$ W

Exercici 4

a) $\eta = \dfrac{P_{elèctr}}{P_{cons}} \Rightarrow P_{cons} = \dfrac{P_{elèctr}}{\eta} = 869{,}6$ MW

b) $P_{cons} = \dfrac{p\,\rho\,V}{t} \Rightarrow V = \dfrac{P_{cons}\,t}{p\,\rho} = 5465\ m^3$

c) $P_{diss\ cg} = P_{cons}(1 - \eta_g) = 591{,}3$ MW

d) $\eta_v = \dfrac{P_{cv}}{P_{diss\ cg}} = \dfrac{P_{elèctr} - P_{cg}}{P_{diss\ cg}} = \dfrac{P_{elèctr} - P_{cons}\,\eta_g}{P_{diss\ cg}} = 0{,}3750$

SÈRIE 5

Primera part

Exercici 1

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

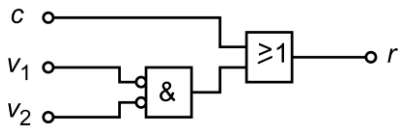
Exercici 2

a)

c	v_1	v_2	r
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

b)
$$r = \bar{c}\cdot\bar{v}_1\cdot\bar{v}_2 + c\cdot\bar{v}_1\cdot\bar{v}_2 + c\cdot\bar{v}_1\cdot v_2 + c\cdot v_1\cdot\bar{v}_2 + c\cdot v_1\cdot v_2$$
$$= c + \bar{v}_1\cdot\bar{v}_2$$

c)



Segona part

OPCIÓ A

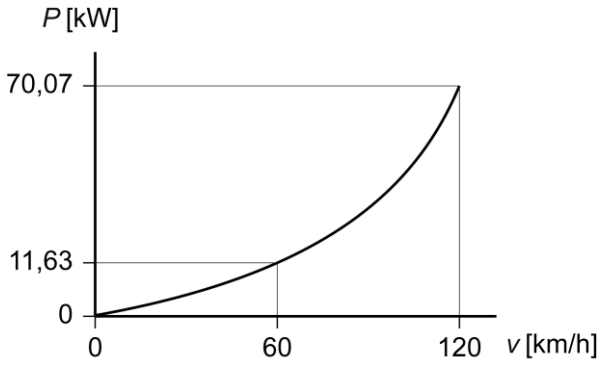
Exercici 3

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

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

$P = \left(63{,}89 v + 0{,}03611 v^3\right)$

amb v en km/h



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

Exercici 4

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

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

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

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

OPCIÓ B

Exercici 3

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

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

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

c) Per a un dels dos taulers:

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

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

Exercici 4

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

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

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

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

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