SÈRIE 3

Exercici 1

Q1 a

Q2 b

Q3 a

Q4 c

Q5 c

Exercici 2

a)

a	*b*	*c*	*d*	*s*
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

b)

$$s=\bar{a}\bar{b}c\bar{d}+\bar{a}\bar{b}cd+\bar{a}b\bar{c}\bar{d}+\bar{a}b\bar{c}d+\bar{a}bc\bar{d}+a\bar{b}\bar{c}\bar{d}+a\bar{b}\bar{c}d+ab\bar{c}\bar{d}+ab\bar{c}d+abc\bar{d}+abcd$$

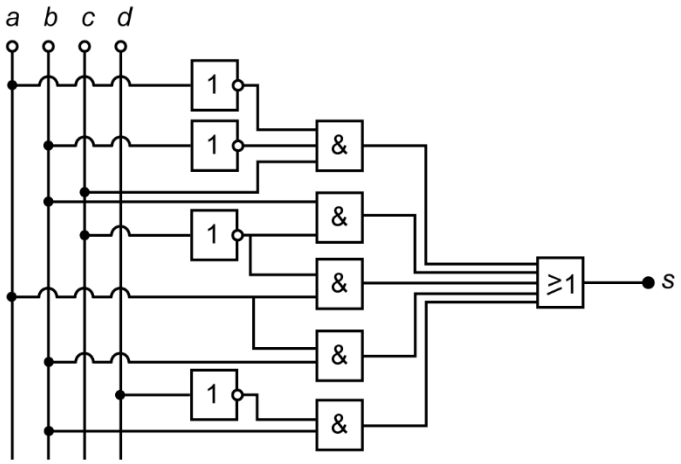
o també

$$s=\left(a+b+c+d\right)\left(a+b+c+\bar{d}\right)\left(a+\bar{b}+\bar{c}+\bar{d}\right)\left(\bar{a}+b+\bar{c}+d\right)\left(\bar{a}+b+\bar{c}+\bar{d}\right)$$

simplificant

$$s=\bar{a}\bar{b}c+b\bar{c}+a\bar{c}+ab+b\bar{d}$$

c)



Exercici 3

a)

$$E_{\text{mec}} = mg\Delta h$$
$$\Delta h = d\sin\varphi_1 - d\sin\varphi_2 = d\sin 45 - d\sin 15 = 1{,}345\,\text{m}$$
$$E_{\text{mec}} = 1319\,\text{J}$$

b)

$$E_{\text{mot}} = \frac{E_{\text{mec}}}{\eta} = 1649\,\text{J}$$

c)

$$v_{\text{vert}} = |\omega| 3l\cos\varphi = 0{,}4534\ \text{m/s}$$

d)

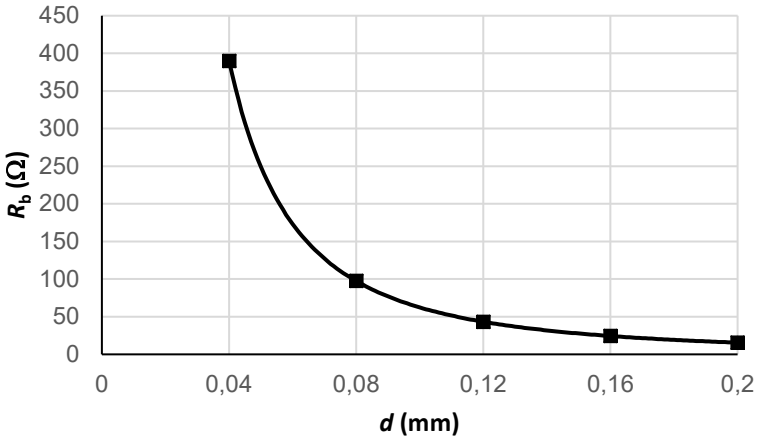
$$P_{\text{mot}} = \frac{P_{\text{mec}}}{\eta} = \frac{mgv_{\text{vert}}}{\eta} = 555{,}8\,\text{W}$$

Exercici 4

a)

$$R = \frac{U^2}{P} = \frac{230^2}{2200} = 24{,}05\,\Omega$$

b)



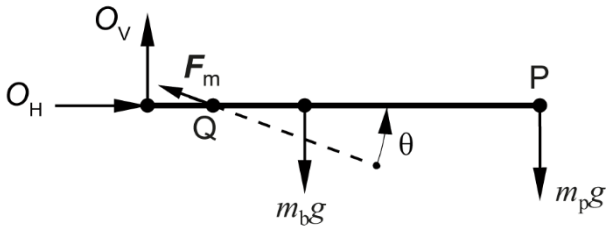
c)

Cal seleccionar la bobina B4, de diàmetre 0,16 mm, ja que la seva resistència és de 24,37 Ω, lleugerament per sobre de la resistència desitjada (24,05 Ω).

$$l = \frac{RS}{\rho} = \frac{R\frac{\pi d^2}{4}}{\rho} = 0{,}987\,\text{m}$$

Exercici 5

a)



b)

$$\sum M(\mathrm{O}) = 0; \quad F_m \sin(\theta) a - m_b g\, b - m_p g\, c = 0 \quad \rightarrow \quad F_m = 688{,}2\ \mathrm{N}$$

c)

$$\left.\begin{array}{ll} \sum F_{\text{horitzontals}} = 0 \quad \rightarrow \quad O_H - F_m \cos(\theta) = 0 & O_H = F_m \cos(20) = 646{,}7\ \mathrm{N} \\ \sum F_{\text{verticals}} = 0 \quad \rightarrow \quad O_V + F_m \sin(\theta) - m_b g - m_p g = 0 & O_V = g(m_b + m_p) - F_m \sin(20) = -166{,}7\ \mathrm{N} \end{array}\right\}$$

Les forces desconegudes (OH i OV) s'han dibuixat en un sentit arbitrari.

El valor i el sentit dibuixat han de ser coherents.

El signe negatiu d'O_V indica que aquesta força té sentit oposat al dibuixat al diagrama de cos lliure.

Exercici 6

a)

$Q_1 = m_a ce_a \Delta T = mce_a \left(100 - T_1\right) = 125{,}9\,\text{MJ}$

$Q_2 = m_a L_v = 3386\,\text{MJ}$

$Q_3 = m_a ce_v \Delta T = mce_v \left(T_2 - 100\right) = 80{,}81\,\text{MJ}$

$E_{dia} = Q_1 + Q_2 + Q_3 = 3592\,\text{MJ}$

b)

$E_{cons} = pc\ m_p = 4157\,\text{MJ}$

$\eta = \dfrac{E_{dia}}{E_{cons}} = 86{,}42\%$

c)

$m_{CO_2} = 365\,FE\ m_p = 96{,}58\,\text{Tn de } CO_2$