

Sèrie 1

Primera part

Exercici 1

Q1 c

Q2 d

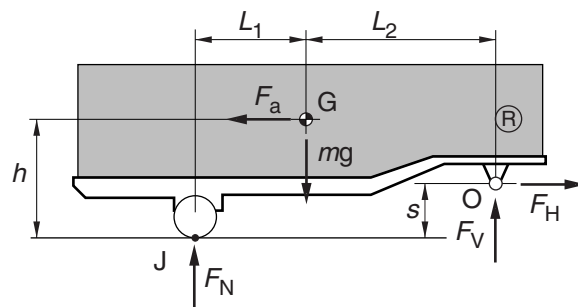
Q3 a

Q4 b

Q5 a

Exercici 2

a)



b) $mg = F_N + F_V$; $F_H = F_a = 3700 \text{ N}$

$$\sum M(O) = 0 \rightarrow F_N(L_1 + L_2) - mgL_2 - F_a(h - s) = 0$$

$$F_N = \frac{mgL_2 + F_a(h - s)}{(L_1 + L_2)} = \frac{23000 \cdot 9,807 \cdot 6 + 3700 \cdot 1,5}{10} = 135,9 \text{ kN}$$

$$F_V = mg - F_N = 23000 \cdot 9,807 - 135892 = 89,7 \text{ kN}$$

c) $v = 78 \text{ km/h} = 21,67 \text{ m/s}$; $P = F_H v = F_a v = 3700 \cdot 21,67 = 80,17 \text{ kW}$

Segona part

OPCIÓ A

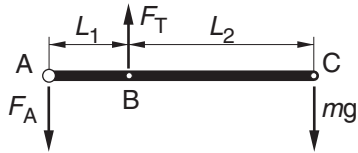
Exercici 3

a) $x = \frac{3m \cdot 1,5L + 2m \cdot L}{3m + 2m} = \frac{4,5L + 2L}{5} = \frac{6,5}{5}L = 0,52 \text{ m}$

b) $y = \frac{3m \cdot 0 + 2m \cdot L}{3m + 2m} = \frac{2L}{5} = 0,16 \text{ m}$

Exercici 4

a)



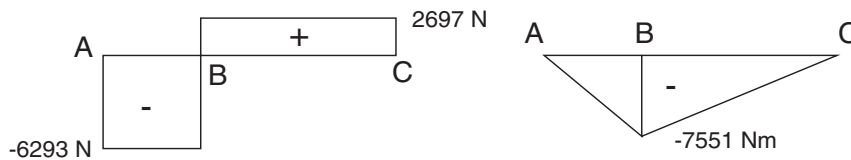
b) $F_T L_1 = mg(L_1 + L_2) \quad ; \quad mg = 275 \cdot 9,807 = 2697 \text{ N}$

$$F_T = \frac{mg(L_1 + L_2)}{L_1} = \frac{2697 \cdot 4}{1,2} = 8990 \text{ N}$$

c) $\sigma_t = \frac{F_T}{\pi d^2 / 4} = \frac{8990}{\pi 10^2 / 4} = 114,5 \text{ MPa} < \sigma_e$

Per tant el tirant no es deforma.
(recordar que $1 \text{ N/mm}^2 = 1 \text{ MPa}$)

d)



OPCIÓ B

Exercici 3

a) $\rho_{rel1} = \rho_1 - \rho_0 = \frac{m_1 g}{S} = \frac{3 \cdot 9,807}{50 \cdot 10^{-4}} = 5884 \text{ Pa}$

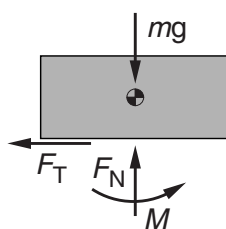
b) $\rho_{rel2} = \rho_2 - \rho_0 = \frac{(m_1 + m_2)g}{S} = \frac{5 \cdot 9,807}{50 \cdot 10^{-4}} = 9807 \text{ Pa}$

$$\rho_1 V_1 = \rho_2 V_2 \rightarrow V_2 = \frac{\rho_1 V_1}{\rho_2} = \frac{(1,013 \cdot 10^5 + 5884) \cdot 30}{(1,013 \cdot 10^5 + 9807)} = 28,94 \text{ l}$$

$$\Delta h = \frac{V_2 - V_1}{S} = \frac{(28,94 - 30) \cdot 10^3}{50} = -21,18 \text{ cm}$$

Exercici 4

a)



b) $F_{T\max} = \mu F_N = \mu mg = ma$

$$a_{\max} = \mu g = 0,7 \cdot 9,807 = 6,865 \text{ m/s}^2$$

c) $F_T = ma = 210 \cdot 1,4 = 294 \text{ N} \quad ; \quad \Gamma = F_T \frac{d}{2} = 294 \frac{0,3}{2} = 44,1 \text{ Nm}$

d) $W_m = \frac{1}{\eta} \left(\frac{1}{2} mv^2 - 0 \right) = \frac{1}{0,9} \left(\frac{1}{2} 210 \cdot 0,6^2 - 0 \right) = 42 \text{ J}$

Sèrie 3

Primera part

Exercici 1

Q1 c

Q2 b

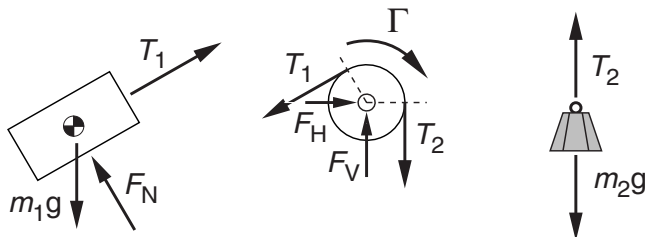
Q3 d

Q4 b

Q5 a

Exercici 2

a)



b) $T_1 = m_1 g \sin \alpha = 56 \cdot 9,807 \cdot 0,5 = 549,2 \cdot 0,5 = 274,6 \text{ N}$

$T_2 = m_2 g = 13 \cdot 9,807 = 127,5 \text{ N}$

$\Gamma + T_2 \frac{d}{2} - T_1 \frac{d}{2} = 0 \rightarrow \Gamma = (T_1 - T_2) \frac{d}{2} = (274,6 - 127,5) 0,11 = 16,18 \text{ Nm}$

c) $W_m - m_1 g \sin \alpha x + m_2 g x = 0 \rightarrow W_m = (m_1 g \sin \alpha - m_2 g) x = (274,6 - 127,5) 1,3 = 191,2 \text{ J}$

Segona part

OPCIÓ A

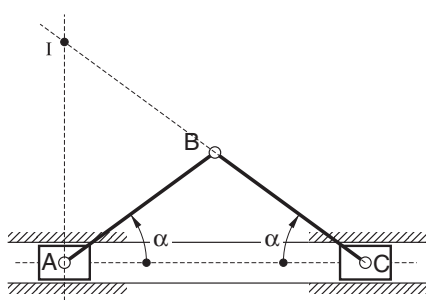
Exercici 3

a) 5 membres: 2 barres, 2 corredors i la guia que actua d'element fix.

b) 5 parells cinemàtics: 3 articulacions i 2 parells guia-corredora.

c) El mecanisme té 2 graus de llibertat. Cal fixar les dues corredors, per exemple, per tal que el mecanisme quedi totalment fixat.

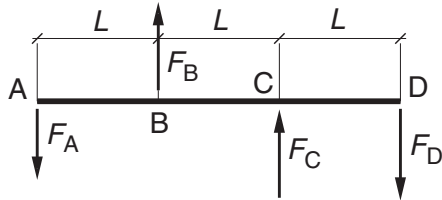
d)



Intersecció de la prolongació de la barra BC amb la recta perpendicular a la guia que passa per A.

Exercici 4

a)



b)

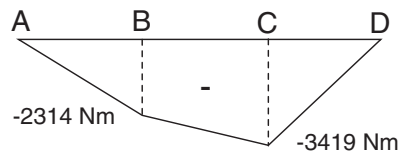
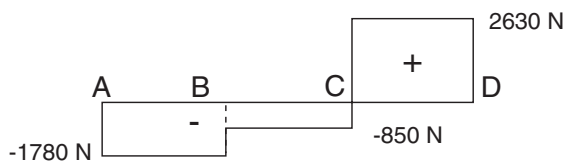
$$F_B + F_C = F_A + F_D = 4410 \text{ N}$$

$$F_A L + F_C L - F_D 2L = 0$$

$$F_C = 2F_D - F_A = 2 \cdot 2630 - 1780 = 3480 \text{ N}$$

$$F_B = F_A + F_D - F_C = 4410 - 3480 = 930 \text{ N}$$

c)

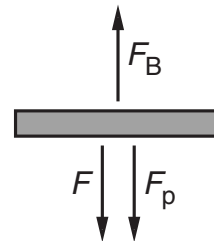


OPCIÓ B

Exercici 3

$$a) \quad p = \rho g h = 10^3 \cdot 9,807 \cdot 1,5 = 14711 \text{ Pa}$$

b)



$$c) \quad F_p = \rho \pi \frac{d^2}{4} = 14711 \cdot \pi \frac{0,07^2}{4} = 56,61 \text{ N}$$

$$F_B = F_p + F = 56,61 + 130 = 186,6 \text{ N}$$

$$d) \quad F_B = \rho V g \rightarrow V = \frac{F_B}{\rho g} = \frac{186,6}{10^3 \cdot 9,807} = 19,03 \cdot 10^{-3} \text{ m}^3 = 19,03 \text{ l}$$

Exercici 4

$$a) \quad n. \text{ voltes} = \frac{x}{p} = \frac{260}{8} = 32,5 \text{ voltes}$$

$$b) \quad v = p \frac{n}{60} = 8 \frac{410}{60} = 54,67 \text{ mm/s}$$

$$e) \quad P = \Gamma \omega = \frac{Fv}{\eta} = \frac{7800 \cdot 54,67 \cdot 10^{-3}}{0,7} = 609,1 \text{ W}$$

$$f) \quad \Gamma = \frac{P}{\omega} = \frac{P}{\pi n/30} = \frac{609,1}{\pi \cdot 410/30} = 14,19 \text{ Nm}$$