

Sèrie 2

Primera part

Exercici 1

Q1 d

Q2 b

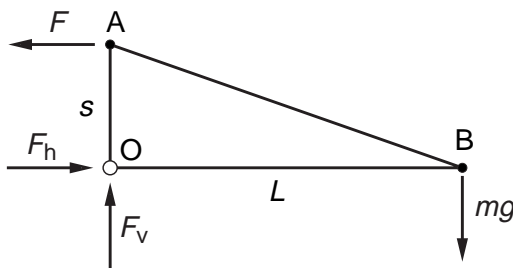
Q3 a

Q4 c

Q5 d

Exercici 2

a)



$$b) \sum M(O) = 0 \rightarrow mgL - Fs = 0$$

$$F = \frac{mgL}{s} = \frac{235 \cdot 9,807 \cdot 1,7}{0,6} = 6530 \text{ N}$$

$$F_h - F = 0 \rightarrow F_h = F = 6530 \text{ N}$$

$$F_v - mg = 0 \rightarrow F_v = mg = 2305 \text{ N}$$

$$c) \omega_{\text{braç}} = \frac{v}{s} = \frac{v_B}{L} \rightarrow v_B = \frac{vL}{s} = \frac{0,15 \cdot 1,7}{0,6} = 0,425 \text{ m/s}$$

$$d) W = mg \Delta h = mgL = 2305 \cdot 1,7 = 3918 \text{ J}$$

Segona part

OPCIÓ A

Exercici 3

$$a) n_{\text{voltes}} = \frac{\text{avanç}}{p} = \frac{4}{1,5} = 2,667 \text{ voltes}$$

$$b) W = \frac{Fs}{\eta} = \frac{350 \cdot 4 \cdot 10^{-3}}{0,9} = 1,556 \text{ J}$$

$$c) W = \Gamma 2\pi n_{\text{voltes}} \rightarrow \Gamma = \frac{W}{2\pi n_{\text{voltes}}} = \frac{1,556}{2 \cdot \pi \cdot 2,667} = 0,0928 \text{ Nm}$$

Exercici 4

a) $p_2 = \rho g h_1 = 1000 \cdot 9,807 \cdot 7 = 68,65 \text{ kPa}$

b) $v_3 = v_4 = \frac{q}{\pi d^2 / 4} = 4 \frac{4,5 \cdot 10^{-3}}{\pi \cdot 0,036^2} = 4,42 \text{ m/s}$

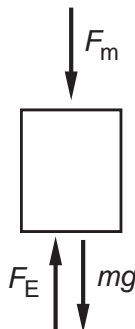
c) $p_3 + \frac{1}{2} \rho v_3^2 = p_4 + \frac{1}{2} \rho v_4^2 + \rho g h_2 + \Delta p$

Essent $v_3 = v_4$ i $p_4 = 0 \rightarrow p_3 = \rho g h_2 + \Delta p = 1000 \cdot 9,807 \cdot 19 + 18700 = 205,03 \text{ kPa}$

d) $P = \frac{(p_3 - p_2)q}{\eta} = \frac{(205,03 - 68,65) \cdot 10^3 \cdot 4,5 \cdot 10^{-3}}{0,71} = 864,4 \text{ W}$

OPCIÓ B**Exercici 3**

a)



b) Força sobre el mesurador = força de la molla.

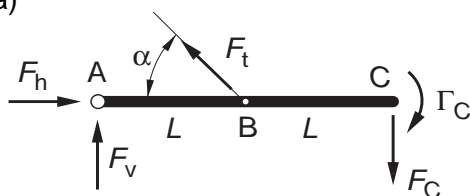
$$F_C = F_m = k(h - h_0) = 9 \cdot (1,7 - 0,5) = 10,8 \text{ N}$$

c) $F_E - F_m - mg = 0 \rightarrow F_E = F_m + mg$ amb $F_E = \rho g V$

$$V = \frac{F_m + mg}{\rho g} = \frac{10,8 + 0,4 \cdot 9,807}{1000 \cdot 9,807} = 1,501 \cdot 10^{-3} \text{ m}^3 = 1,501 \text{ l}$$

Exercici 4

a)



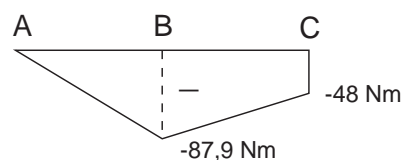
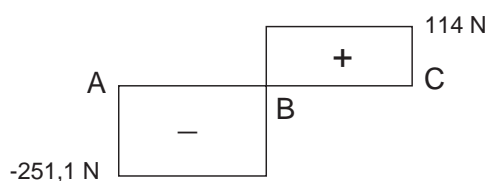
b) $F_h - F_t \cos \alpha = 0$; $F_v + F_t \sin \alpha - F_C = 0$

$$\sum M(A) = 0 \rightarrow \Gamma_C + F_C 2L - F_t \sin \alpha L = 0$$

$$F_t = \frac{\Gamma_C + F_C 2L}{L \sin \alpha} = \frac{48 + 114 \cdot 2 \cdot 0,35}{0,35 \cdot \sin 45^\circ} = 516,4 \text{ N}$$

$$F_v = F_C - F_t \sin \alpha = 114 - 516,4 \cdot \sin 45^\circ = -251,1 \text{ N}$$

c)



SÈRIE 5

Primera part

Exercici 1

Q1 c

Q2 a

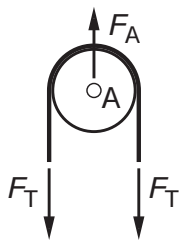
Q3 d

Q4 b

Q5 d

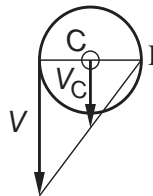
Exercici 2

a)

b) $v = ct. \rightarrow F_T = mg$

$$F_c = 2F_T = 2mg = 2 \cdot 1450 \cdot 9,807 = 28,44 \text{ kN}$$

c)



$$v_c = v/2 = 0,2 \text{ m/s}$$

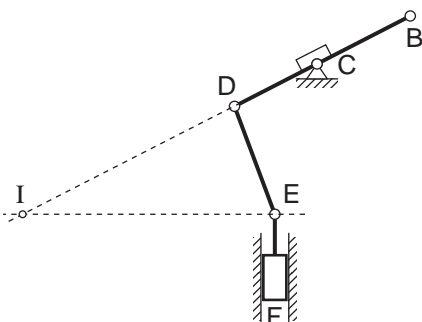
Segona part

OPCIÓ A

Exercici 3

- Hi ha 5 membres més el terra: la manovella OA, el balancí DCB, 2 bieles, AB i DE, i el pistó (o corredora) F.
- Hi ha 7 parells cinemàtics: 6 articulacions, o parells de revolució, i un parell guia-corredora.
- El mecanisme té un grau de llibertat. Fixant el balancí, la resta de membres queden aturats.

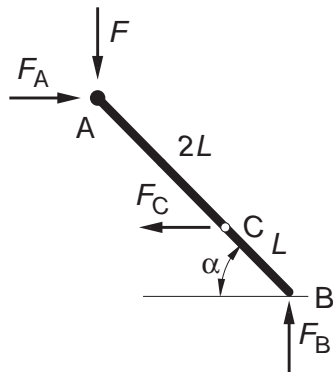
d)



Intersecció entre la prolongació del balancí DCB i la recta perpendicular a la guia que passa per E.

Exercici 4

a)



b) $F_B = F = 6700 \text{ N}$; $F_A = F_C$

$F_C 2L \sin \alpha = F_B 3L \cos \alpha$

$F_C = \frac{3}{2} F_B \cot \alpha = \frac{3}{2} 6700 \cdot 1 = 10050 \text{ N}$

$F_A = F_C = 10050 \text{ N}$

c) $\sigma = \frac{F_C}{a^2} = \frac{10050 \text{ N}}{64 \text{ mm}^2} =$

$= 157 \text{ N/mm}^2 < \sigma_e = 230 \text{ N/mm}^2$

Per tant no es deforma.

OPCIÓ B

Exercici 3

$S_1 = \frac{\pi}{4} d_1^2 = \frac{\pi}{4} 0,025^2 = 409,9 \cdot 10^{-6} \text{ m}^2$; $S_2 = \frac{\pi}{4} d_2^2 = \frac{\pi}{4} 0,016^2 = 201,1 \cdot 10^{-6} \text{ m}^2$

a) $F_m = \rho_1 S_1 = 3 \cdot 10^5 \cdot 409,9 \cdot 10^{-6} \text{ m}^2 = 147,3 \text{ N}$

b) $p_1 = 4 \text{ bar}$; $p_2 = 0$

$v_1 = \frac{q}{S_1} = \frac{2,5 \cdot 10^{-3}}{409,9 \cdot 10^{-6}} = 5,039 \text{ m/s}$; $v_2 = \frac{q}{S_2} = \frac{2,5 \cdot 10^{-3}}{201,1 \cdot 10^{-6}} = 12,43 \text{ m/s}$

$p_1 + \frac{1}{2} \rho v_1^2 = p_2 + \frac{1}{2} \rho v_2^2 + \Delta p$

$\Delta p = p_1 - p_2 + \frac{1}{2} \rho (v_1^2 - v_2^2) = 4 \cdot 10^5 - 0 + \frac{1}{2} 1000 (5,039^2 - 12,43^2) =$
 $= 335,7 \text{ kPa} = 3,357 \text{ bar}$

Exercici 4

a) $\Gamma = Fr \begin{cases} \text{per } r_0 \rightarrow \Gamma = 37 \cdot 0,15 = 5,55 \text{ Nm} \\ \text{per } r_e \rightarrow \Gamma = 37 \cdot 0,35 = 12,95 \text{ Nm} \end{cases}$

b) $\omega = \frac{v}{r} \begin{cases} \text{per } r_0 \rightarrow \omega = 1,6 / 0,15 = 10,67 \text{ rad/s} \\ \text{per } r_e \rightarrow \omega = 1,6 / 0,35 = 4,571 \text{ rad/s} \end{cases}$

c) $t = \frac{l}{v} = \frac{1000}{1,6} = 625 \text{ s}$

$W = Fvt = Fl = 37 \cdot 1000 = 37 \text{ kJ}$

