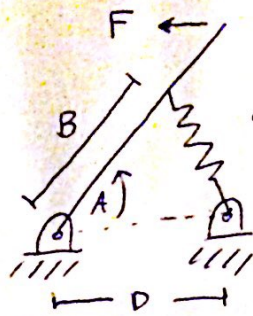


P21 X
(a)

4 puntos



$$L_{\text{barru}} = C$$

→ equilibrio x fuerza horizontal F

→ Det. A para equilibrio en terminos de ctes.

$$F = 45 \text{ [N]}$$

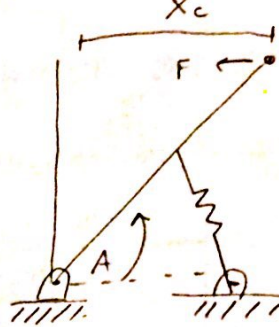
$$k = 14,01 \text{ [kN/m]}$$

$$B = 21,6 \text{ [cm]}$$

$$D = 14 \text{ [cm]}$$

$$C = 40,6 \text{ [cm]}$$

$$L_0 = 25,4 \text{ [cm]}$$



Trabajos virtuales

→ Como la fuerza es horizontal, se utiliza x_c como coordenada para F

$$(a) \quad x_c = C \cos A$$

$$\boxed{\delta x_c = -C \sin A \delta A} \quad 0,5$$

$$(b) \quad L^2 = (D - B \cos A)^2 + (B \sin A)^2$$

$$= D^2 + B^2 - 2DB \cos A$$

$$2L \delta L = 2DB \sin A \delta A$$

$$\boxed{\delta L = \frac{DB \sin A}{\sqrt{D^2 + B^2 - 2DB \cos A}} \delta A} \quad 0,5$$

$$\delta W = \delta W_F - \delta W_R = 0 \quad (\text{equilibrio}) \quad 0,5$$

$$0,5 \rightarrow \delta W_F = -F \delta x_c = FC \sin A \delta A$$

$$0,5 \rightarrow \delta W_R = \frac{\partial}{\partial A} \left[\frac{1}{2} k (L - L_0)^2 \right] \leftarrow \text{energía resorte}$$

$$= k (L - L_0) \delta L$$

P2) (a)

$$\delta W = FC \sin A \delta A - k(L - L_0) \left[\frac{DB \sin A}{\sqrt{D^2 + B^2 - 2DB \cos A}} \right] \delta A$$

$$\left[FC \cdot L - kDBL + kDBL_0 = 0 \right] \quad 0,25$$

$$L(FC - kDB) = -kDBL_0$$

$$\sqrt{D^2 + B^2 - 2DB \cos A} = \frac{-kDBL_0}{FC - kDB} \quad / ()^2$$

$$D^2 + B^2 - 2DB \cos A = \frac{(kDBL_0)^2}{(FC - kDB)^2}$$

$$\cos A = \frac{D^2 + B^2 - \left(\frac{kDBL_0}{FC - kDB} \right)^2}{2DB}$$

1,0 ~~0,8~~

$$A = \cos^{-1} \left[\frac{D^2 + B^2 - \left(\frac{kDBL_0}{FC - kDB} \right)^2}{2DB} \right]$$

$$\left[A = 93,98^\circ \right] \quad 0,25$$