

Pl 1 Forage, (CCINP NP 23)

Q1 On isole (S3), soumis aux actions du câble, de la perçante, de (S2) (climère), du forage.

En écrivant le TRS sur  $\vec{z}$  on obtient  $F_{sol} = mg - 2F_w$

Q2 On isole (1+2+3)

$$\text{TRS sur } \vec{z} \Rightarrow F_g + F_d - \pi_g + F_{nl} = 0$$

$$\begin{aligned} \vec{\Pi}_{F_d}(O) &= \vec{\Pi}_{F_d}(I) + \vec{OI} \wedge \vec{F_d} \\ &= \vec{0} + a\vec{x} \wedge F_d \vec{z} = -aF_d \vec{y} \end{aligned}$$

$$\begin{aligned} \Pi_{F_g}(O) &= \Pi_{F_g}(I) + \vec{OI} \wedge \vec{F_g} \\ &= \vec{0} + -a\vec{x} \wedge F_g \vec{z} = aF_g \vec{y} \end{aligned}$$

$$\begin{aligned} \vec{\Pi}_{\pi_g}(O) &= \vec{\Pi}_{\pi_g}(G) + \vec{OG} \wedge -\pi_g \vec{z} \\ &= \vec{0} + (r\vec{x}_2 + zc\vec{z}) \wedge -\pi_g \vec{z} \\ &= r\pi_g \vec{y}_2 = r\pi_g (-\sin\theta \vec{x} + \cos\theta \vec{y}) \end{aligned}$$

$$\begin{aligned} \vec{\Pi}_{F_{nl}}(O) &= \vec{\Pi}_{F_{nl}}(F) + \vec{OF} \wedge \vec{F_{nl}} \\ &= \vec{0} + R\vec{x}_2 \wedge F_{nl} \vec{z} \\ &= -R F_{nl} \vec{y}_2 = R F_{nl} (\sin\theta \vec{x} - \cos\theta \vec{y}) \end{aligned}$$

$$\text{TRS} \Rightarrow \begin{cases} -r\pi_g + R F_{nl} = 0 \\ aF_g - aF_d + r\pi_g \cos\theta - R F_{nl} \cos\theta = 0 \end{cases}$$

Rayons :  $aF_g + aF_d - a\pi_g + aF_{nl} = 0$

(2)

$$F_g = \frac{(R F_{rel} - r r_g) \cos \theta + a (r r_g - F_{rel})}{2a}$$

$$F_d = \frac{a (r r_g - F_{rel}) + (r r_g - R F_{rel}) \cos \theta}{2a}$$

Basculer  $\Leftrightarrow F_g = 0$

De + :  $F_{rel} = 0 \Rightarrow -r \cos \theta + a = 0$   
 $r \cos \theta = a$

Pour ne pas basculer, il faut que la projection de  $\vec{OC}$  sur  $(0, \vec{x})$  soit  $< a$

$$\theta_{cr} = 100 \frac{|r \cos \theta|}{a} \quad \left| \begin{array}{l} \text{Lorsque } \theta_{cr} = 100 \text{ on} \\ \text{bascule} \end{array} \right.$$

(Q5)  $\vec{OC} \cdot \vec{x} = r = \frac{m_b \times 0 + m_c \times 5,4 + m_e \times -5,3}{m_b + m_c + m_e}$

$$r = \frac{4,5 \times 58,8 - m \times 8 \times 5,3}{44,7 + 58,8 + m \times 8}$$

Exigence 1.2  $\Rightarrow r = \frac{a}{2} = 1,05$

$\Rightarrow \dots m =$