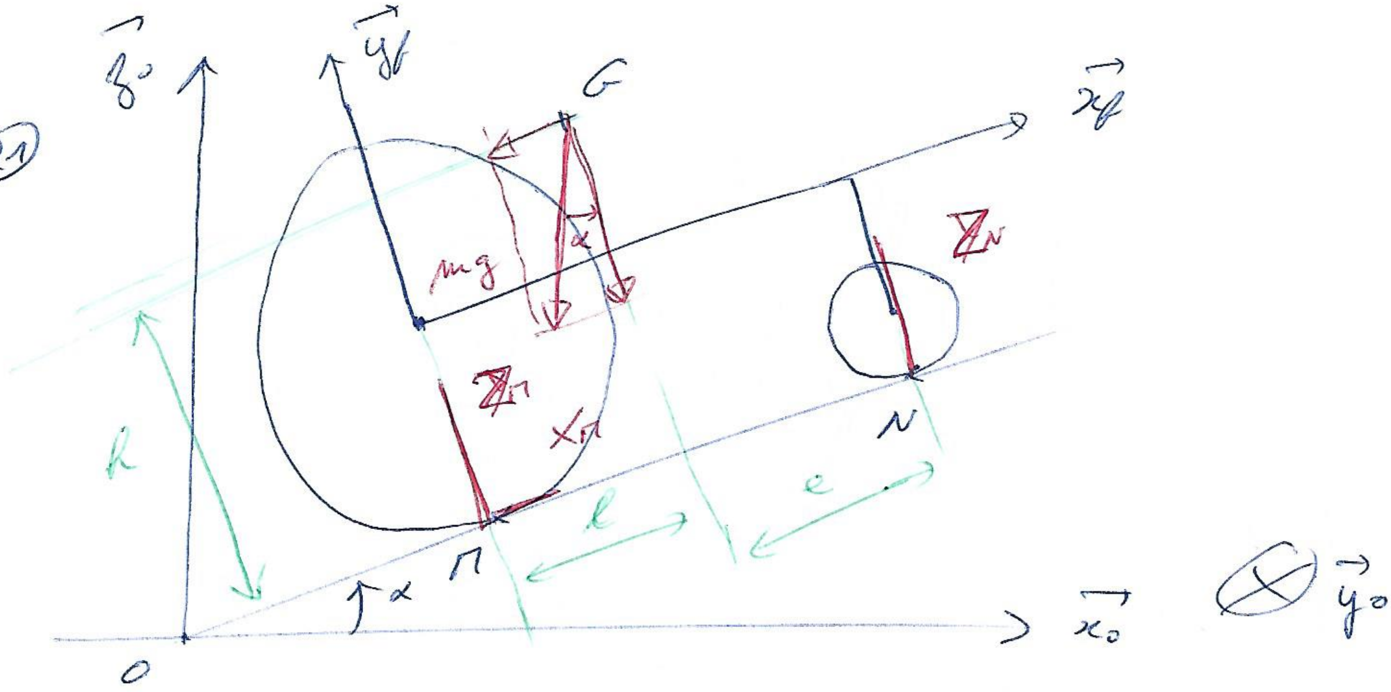
(1)

Roue Autonome

(Q1)



$$\{\mathcal{T}_{sol \to av}\} = \left\{\begin{matrix} Y_N \cdot \vec{y_f} \\ \vec{0} \end{matrix}\right\}_N = \left\{\begin{matrix} 0 & 0 \\ Y_N & 0 \\ 0 & 0 \end{matrix}\right\}_{N, B_f}$$

$$\{\mathcal{T}_{sol \to ar}\} = \left\{\begin{matrix} X_M \vec{x_f} + Y_M \vec{y_f} \\ \vec{0} \end{matrix}\right\}_M = \left\{\begin{matrix} X_M & 0 \\ \cancel{Y_M} & 0 \\ \cancel{Z_M} & 0 \end{matrix}\right\}_{M, B_f}$$

$$\{\mathcal{T}_{pes \to S}\} = \left\{\begin{matrix} -mg\,\vec{z_0} \\ \vec{0} \end{matrix}\right\}_G$$

(Q2) $\vec{\delta}(G, S/R_0) = \vec{0}$

(Q3) $\vec{Rd}(S/R_0) = m \cdot \ddot{x} \cdot \vec{x_f}$

<u>On isole (S), PFD (TMD en G)</u> $\Longrightarrow$

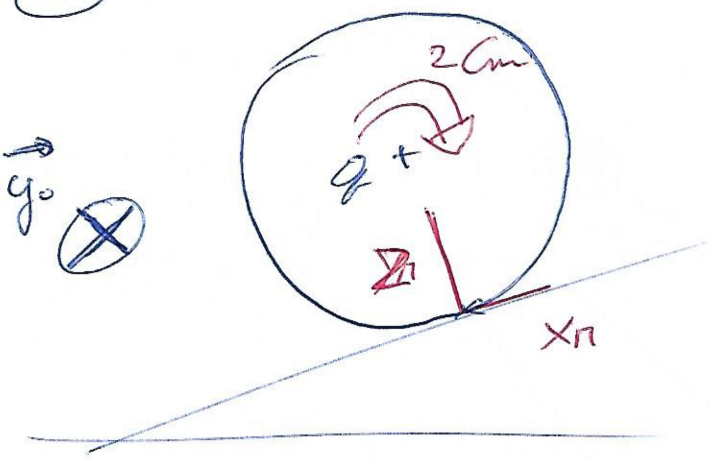
$$\left|\begin{aligned} m\ddot{x} &= X_M - mg\sin\alpha \\ 0 &= Y_M + Y_N - mg\cos\alpha \\ 0 &= Y_N \cdot e + h X_M - l\, Y_M \end{aligned}\right.$$

$\rightarrow$ 3 équations
4 inconnues
$X_M, Y_M, Y_N, \ddot{x}$

Roue Autonome (Suite)

Q4 Limite glissement $\Rightarrow$ $X_{r1} = f \cdot Z_{r1}$ $\Rightarrow$ 1 équation en + $\Rightarrow$ On peut resoudre $\Rightarrow$ on trouve $\ddot{x} = 4,15\ ms^{-2}$

Q5



TMD en G (Inertie negligée).

$0 = 2Cm - R X_{r1}$

$\Rightarrow Cm = \dfrac{R X_{r1}}{2}$

avec $X_{r1} = \text{fonc}(\ddot{x} \dots)$

On trouve $Cm = 160\ Nm$

Q6 Cm maximum $= 70\ Nm < 160\ Nm$.

On calcul Z_{r1} à la limite du glissement ... $Z_{r1} = -317\ N$

$\Rightarrow$ Basculement (avant glissement).

Q7 On utilise les 3 equations du PFD.

On donne $Cm = 70\ Nm$ $\Rightarrow$ $X_{r1} = \dfrac{2Cm}{R} = 350\ N$

On calcul $Z_N = 137\ N > 0$ (Pas de basculement)

$Z_{r1} = 1324\ N$

$\ddot{x} = 1,17\ ms^{-2}$

On vérifie $T < f.N \Rightarrow \dfrac{X_{r1}}{Z_{r1}} = \dots < f = 0,45$