

Axe de robot

$$\begin{aligned} \textcircled{Q1} \quad E_c(\Sigma/3) &= \frac{1}{2} m \dot{\lambda}^2 + \frac{1}{2} J \dot{\theta}^2 \\ &= \frac{1}{2} (J + m r^2) \dot{\theta}^2 \end{aligned}$$

$$\textcircled{Q2} \quad P(\text{int } \Sigma) = 0$$

$$\begin{aligned} \textcircled{Q3} \quad P(\Sigma \rightarrow \Sigma/3) &= C_n \dot{\theta} + X \dot{\lambda} \\ &= (C_n + r X) \dot{\theta} \end{aligned}$$

$$\textcircled{Q4} \quad (J + m r^2) \ddot{\theta} = C_n + r X$$