

ME 274 – Spring 2024 – 1:30 – Quiz 4

Problem 1

Two bodies, A and B, are connected by a cable-pulley system. The motions of A and B are represented by the finite distances of s_A and s_B , respectively, and the length of the inextensible cable is known to be $L = 3s_B + 2\sqrt{s_A^2 + h^2} + \text{constants}$, where $h = \text{constant}$. Let v_A and v_B be the speeds of A and B, respectively.

a) $v_A > v_B$

b) $v_A = v_B$

c) $v_A < v_B$

d) More information is needed.

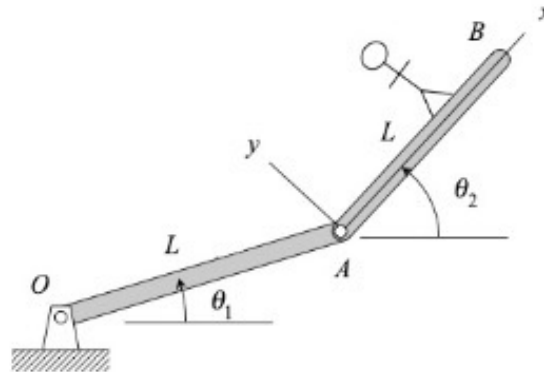
$$\frac{d}{dt} L = \frac{d}{dt} [3s_B + 2\sqrt{s_A^2 + h^2}] = 0$$

$$\hookrightarrow 3\dot{s}_B + \frac{2(2)}{2} \frac{\Delta s_A \dot{s}_A}{\sqrt{\Delta s_A^2 + h^2}} = 0$$

$$\hookrightarrow v_B = \frac{2}{3} \frac{\Delta s_A}{\sqrt{\Delta s_A^2 + h^2}} v_A$$

< 1

The rotation rates for the two bars OA and AB are $\dot{\theta}_1 = \text{constant}$ and $\dot{\theta}_2 \neq \text{constant}$, respectively. An observer is attached to link AB.



The observer and B are on the same rigid body \Rightarrow

$$(\vec{v}_{B/A})_{rel} = (\vec{a}_{B/A})_{rel} = \vec{0}$$

Problem 2 - TRUE or FALSE: $(\vec{v}_{B/A})_{rel} = \vec{0}$

Problem 3 - TRUE or FALSE: $(\vec{a}_{B/A})_{rel} = \vec{0}$