Homework 3.I

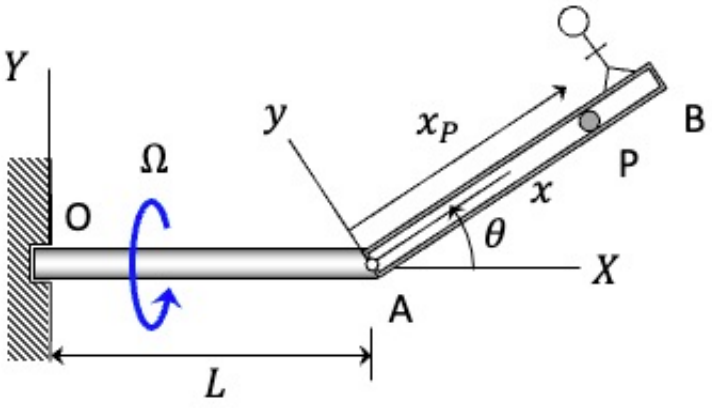
Given: A horizontal shaft OA rotates about a fixed axis with a constant rate of Ω. A slotted arm AB is pinned to OA at end A, with OA being raised at a constant rate of $\dot{\theta}$. A particle P is constrained to move with the slot of AB, with x_P being the distance along the slot from A and with $\dot{x}_P$ being constant. An observer and a set of xyz-axes are attached to AB, and the XYZ-axes are stationary.

Find: Consider the position of arm AB of $\theta = 90°$. Using the 3D moving reference frame kinematics equations:

(a) Determine the angular velocity of AB. Write this answer as a vector.

(b) Determine the angular acceleration of AB. Write this answer as a vector.

(c) Determine the acceleration of particle P. Write this answer as a vector.



Your answers should be in terms of, at most: Ω, $\dot{\theta}$, x_P, $\dot{x}_P$ and L.