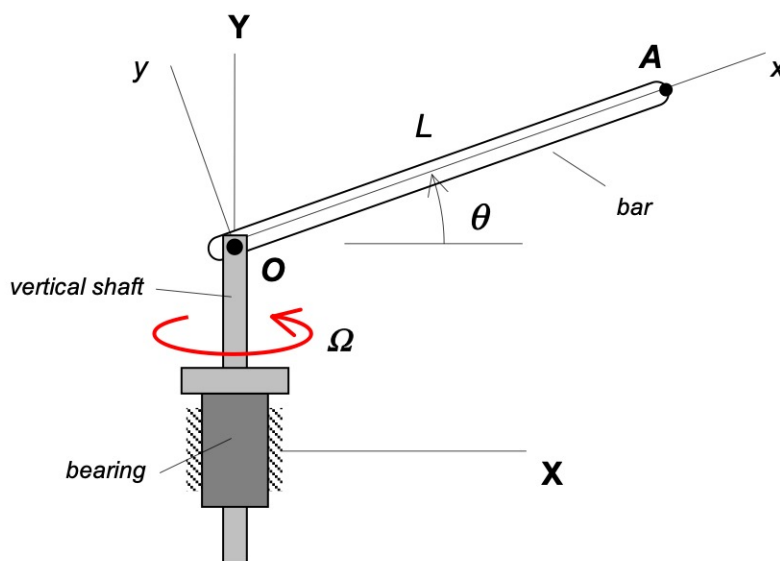


Homework H.3.E

Given: A shaft rotates about a fixed vertical axis at a constant rate of Ω , as shown below. A straight bar OA, having a length of L , is pinned to point O on the shaft, with O being on the rotation axis of the shaft. At the instant when $\theta = 0^\circ$, bar OA is being raised at a rate of $\dot{\theta}$ from the horizontal plane, with this rate changing at a rate of $\ddot{\theta}$. A set of xyz coordinate axes is attached to bar OA with its origin at O. A second set of coordinate axes, XYZ , are fixed to ground. At the instant when $\theta = 0^\circ$, the xyz and XYZ axes are aligned with each other.

Find: For the instant when $\theta = 0^\circ$, determine the angular velocity and angular acceleration of bar OA.



Use the following parameters in your analysis: $\Omega = 5 \text{ rad/s}$, $\dot{\theta} = 4 \text{ rad/s}$, $\ddot{\theta} = -3 \text{ rad/s}^2$ and $L = 2 \text{ m}$.

Homework H.3.F

Given: A motor rests on a platform at the top of a vertical shaft, with the shaft rotating about a fixed, vertical axis at a constant rate of ω_1 . A disk of radius R is attached to the output shaft of the motor at a distance of $2R$ from the vertical shaft axis at O . The motor turns at a constant rate of ω_2 . A set of xyz -coordinate axes are attached to the disk. Point P lies on the perimeter of the disk on the y -axis. At the position shown, the y -axis is aligned with the vertical shaft axis.

Find: For the position shown,

- determine the angular velocity and angular acceleration of the disk.
- determine the velocity and acceleration of P on the disk.

Leave your answers in terms of, at most, R , ω_1 and ω_2 . Write your answers as vectors in terms of their xyz -components.

HINT: Consider using an observer attached to the disk, as shown.

