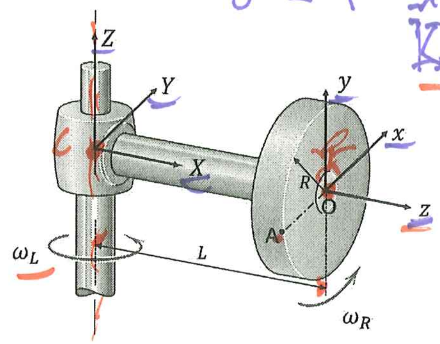
$\hat{I} = \hat{k}$

$\hat{J} = \hat{i}$

$\hat{K} = \hat{j}$

Problem 1.2

(6 pts) Disk O with radius R is attached to a rotating arm with length L. The disk is rotating with a constant angular speed of ω_R and the arm is rotating with a constant angular speed of ω_L with directions as shown in the figure. A moving reference frame is attached to the disk at center O. At the given moment, point A is located in the $-x$ direction from O with the figure showing the relationship between the fixed and moving reference frame axis.



The following equation is used to calculate the acceleration of A:

$$\vec{a}_A = \vec{a}_O + (\vec{a}_{A/O})_{rel} + \vec{\alpha} \times \vec{r}_{A/O} + 2\vec{\omega} \times (\vec{v}_{A/O})_{rel} + \vec{\omega} \times [\vec{\omega} \times \vec{r}_{A/O}]$$

Complete the expression for the following terms in the acceleration equation for the instant shown using the **Moving Reference Frame** unit vectors.: (Treat R, L, ω_R, and ω_L as given values)

$\hat{i}$ $\hat{j}$ $\hat{k}$

I. $\vec{\omega} =$ $\omega_L \hat{K} + \omega_R \hat{k} = \omega_L \hat{j} + \omega_R \hat{k}$

II. $\vec{\alpha} =$ $\frac{d\omega}{dt} = \cancel{\dot{\omega}_L \hat{K}} + \cancel{\omega_L \dot{\hat{K}}} + \cancel{\dot{\omega}_R \hat{k}} + \omega_R \dot{\hat{k}} = \omega_R(\vec{\omega} \times \hat{k})$

rigid body $\omega_R([\omega_L \hat{K} + \omega_R \hat{k}) \times \hat{k}] = \omega_R \omega_L \hat{i}$

III. $\vec{a}_O =$ $\vec{a}_C + \vec{\alpha} \times \vec{r}_{O/C} - \omega^2 \vec{r}_{O/C} = -\omega_L^2 L \hat{k}$

$\dot{\omega}_L$ ω_L

IV. $\vec{r}_{A/O} =$ $-R\hat{i}$

V. $(\vec{v}_{A/O})_{rel} =$ 0

VI. $(\vec{a}_{A/O})_{rel} =$ 0