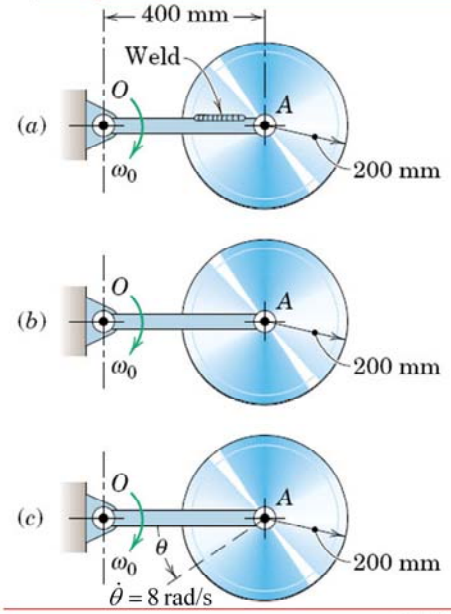
Impulse-Momentum for Rigid Bodies: Exercise 2



A uniform circular disk has a ***mass*** of ***25 kg*** and is mounted to a rotating bar in three different ways and ω_O ***= 4 rad/s***

Determine the ***angular momentum*** H_O of the disk about ***point O*** for each case.

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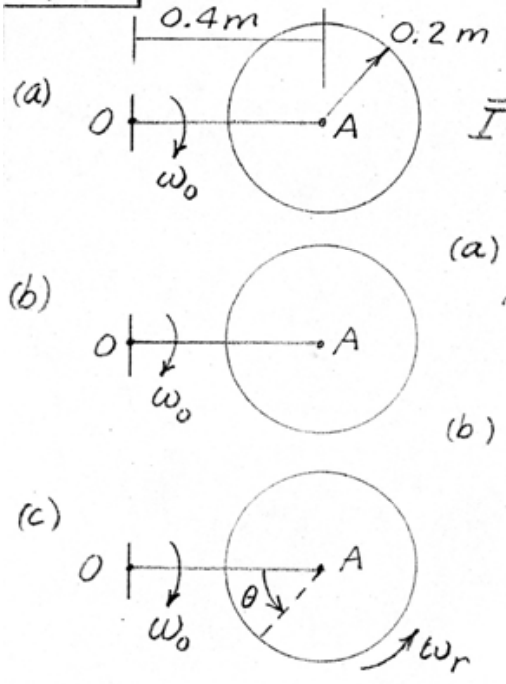

$\omega_0 = 4$ rad/s

ω = angular velocity of disk

$\bar{I} = I_A = \frac{1}{2} m r^2 = \frac{1}{2} 25 (0.2)^2$

$= \frac{1}{2}$ kg·m²

(a) $\omega = \omega_0$

$H_0 = I_0 \omega = \left(\frac{1}{2} + 25[0.4]^2\right) 4$

$= \underline{18 \text{ kg·m}^2/\text{s}}$

(b) $\omega = 0$

$H_0 = m\bar{v}d = 25(0.4)(4)(0.4)$

$= \underline{16 \text{ kg·m}^2/\text{s}}$

(c) $\omega = \omega_0 - \omega_r = 4 - 8 = -4$ rad/s

$H_0 = \bar{I}\omega + m\bar{v}d$

$= \frac{1}{2}(-4) + 16$

$= \underline{14 \text{ kg·m}^2/\text{s}}$