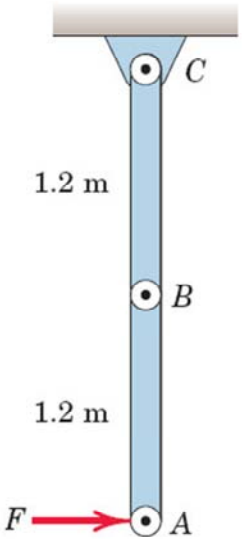
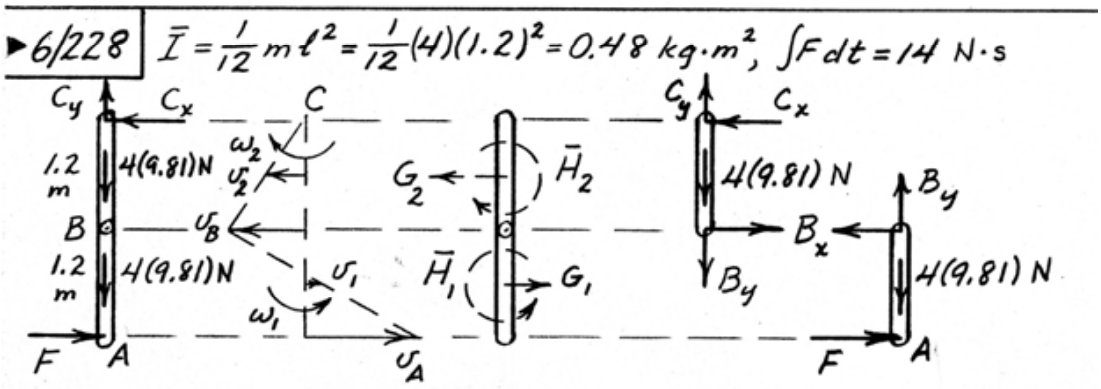
Impulse-Momentum for Rigid Bodies: Exercise 3



Two slender bars, each with ***mass*** of ***4 kg***, are at rest and hinged at ***B*** and ***C***. An ***impulse*** of ***14 N·s*** is applied to the ***end A*** for ***0.1 s***.

Determine the ***angular velocity*** ω_2 of the ***upper bar*** immediately after the ***impulse***.



$\omega_2 = v_2/0.6$, $\omega_1 = (v_1 + v_B)/0.6 = (v_1 + 2v_2)/0.6$, $m = 4\ kg$

System: $\int \Sigma M_C\,dt = \Sigma \Delta H_C$: $14(2.4) = 4v_1(1.8) + 0.48\omega_1 - 4v_2(0.6) - 0.48\omega_2$ (a)

AB: $\int \Sigma M_C\,dt = \Delta H_C$: $14(2.4) - \int 1.2\,B_x\,dt = 4v_1(1.8) + 0.48\omega_1$ (b)

$\int \Sigma F_x\,dt = \Delta G_x$: $14 - \int B_x\,dt = 4v_1$ (c)

(b) & (c) & ω_1 give $2v_1 + v_2 = 10.5$

(a) & ω_1, & ω_2 give $5v_1 - v_2 = 21$

Combine & get $v_1 = 4.5\ m/s$, $v_2 = 1.5\ m/s$

& $\omega_2 = 2.50\ rad/s$