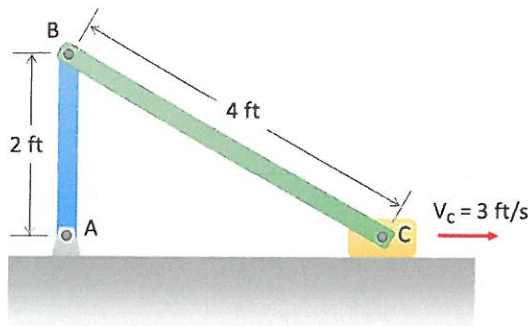


Work Energy I - Problem 3

The mechanism consists of two rods, AB and BC , which weigh 10 lb and 20 lb, respectively, and a 4-lb block at C . Determine the kinetic energy of the system at the instant shown, when the block is moving at 3 ft/s.



LINK AB (RAFA)

$$T_{AB} = \cancel{\frac{1}{2} m V^2} + \frac{1}{2} I_G \omega^2 = \frac{1}{2} \underbrace{\left(\frac{1}{3} \left(\frac{10}{32.2} \right) (2)^2 \right)}_{I_G} \underbrace{(1.5)^2}_{\omega_{AB}}$$

$T_{AB} = 0.466 \text{ Ft} \cdot \text{lbs}$

LINK BC (NO ICV) \therefore NO ROTATION

$$T_{BC} = \frac{1}{2} m V^2 + \cancel{\frac{1}{2} I_G \omega^2} = \frac{1}{2} \left(\frac{20}{32.2} \right) (3)^2$$

$V_C = V_B$
 $= V_{CG \text{ of } BC}$

$T_{BC} = 2.80 \text{ Ft} \cdot \text{lbs}$

BLOCK C TRANSLATION

$$T_C = \frac{1}{2} m V^2 + \cancel{\frac{1}{2} I_G \omega^2} = \frac{1}{2} \left(\frac{4}{32.2} \right) (3)^2$$

$T_C = 0.559 \text{ Ft} \cdot \text{lbs}$

$T_{TOTAL} = T_{AB} + T_{BC} + T_C = 0.466 + 2.80 + 0.559$

$T_{TOTAL} = 3.83 \text{ Ft} \cdot \text{lbs}$