*Department of Mechanical Engineering*

Example Problem - Le 15

Ex.   The slender rod of mass *m* and length *L* is released from rest without rotating. When it falls a distance L, the end of A strikes the hook S, which provides a permanent connection. Determine the angular velocity of the rod after it has rotated 90 degrees. Treat the rod's weight during the impact as a non-impulsive force.
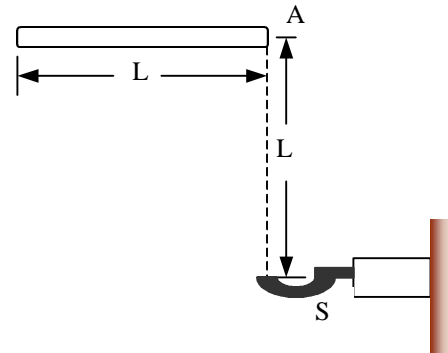
Strategy: COE to get v_G just before impact (1 to 2)
COAM(FT) to get v_G and ω after impact (2 to 3)
COE to get ω after rotating (3 to 4)

Solutions:

Process 1 to 2

$$v_{G2} = \sqrt{2gL}$$

Process 2 to 3

$$\mathbf{w}_3 = \frac{3}{2}\frac{\sqrt{2gL}}{L}$$

$$v_{G3} = \frac{3}{4}\sqrt{2gL}$$

Process 3 to 4

$$\mathbf{w}_4 = \sqrt{\frac{720}{96}\frac{g}{L}} \quad \Rightarrow \quad \overline{\mathbf{w}}_4 = \sqrt{\frac{720}{96}\frac{g}{L}}\,\hat{k}\ rad/s$$