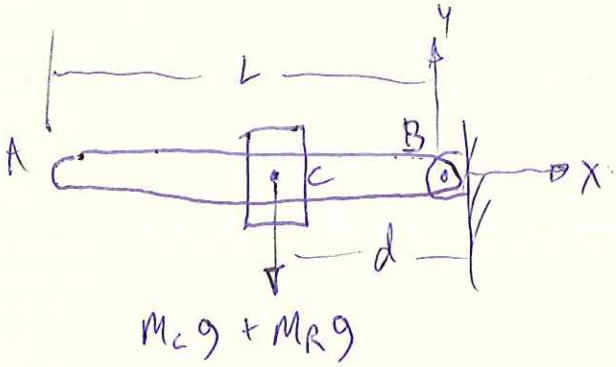
PROB. 17-22

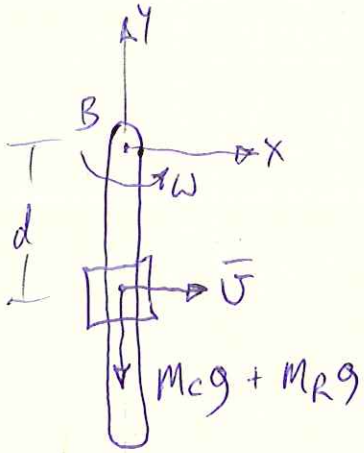
$M_C = 1^{kg}$, $d = 0.3^{m}$, $M_R = 3^{kg}$, $L = 0.6^{m}$, $\omega_0 = 0$

FIND ω FOR $\theta = 90°$

POSITION 1



POSITION 2



CONSERVATION OF ENERGY:

$T_1 + V_1 = T_2 + V_2$

$T_1 = 0, \; V_1 = 0$

$T_2 = \frac{1}{2} M_R \bar{v}_R^2 + \frac{1}{2} \bar{I} \omega^2 + \frac{1}{2} M_C \bar{v}_C^2$

$\bar{v}_R = r\omega = d\omega, \; \bar{v}_C = d\omega, \; \bar{I} = \frac{1}{12} M_R L^2$

$T_2 = \frac{1}{2} M_R (d\omega)^2 + \frac{1}{2} \left(\frac{1}{12} M_R L^2 \right) \omega^2 + \frac{1}{2} M_C (d\omega)^2$

$T_2 = \frac{\omega^2}{2} \left(M_R d^2 + \frac{1}{12} M_R L^2 + M_C d^2 \right)$

$V_2 = V_g = Wh = -(M_C + M_R) g d$

$0 = \frac{\omega^2}{2} \left(M_R d^2 + \frac{1}{12} M_R L^2 + M_C d^2 \right) - (M_C + M_R) g d$

$$\omega = \sqrt{\frac{2(M_C + M_R) g d}{\left(M_R d^2 + \frac{1}{12} M_R L^2 + M_C d^2 \right)}}$$

PROB. 17-22 CONT.

$$\omega = \sqrt{\frac{2(1+3\,kg)(9.81\,\frac{m}{s^2})(0.3\,m)}{\left[(3\,kg)(0.3\,m)^2 + \frac{1}{12}(3\,kg)(0.6\,m)^2 + (1\,kg)(0.3\,m)^2\right]}}$$

$$\omega = 7.233\ \frac{RAD}{s}\ \curvearrowright$$