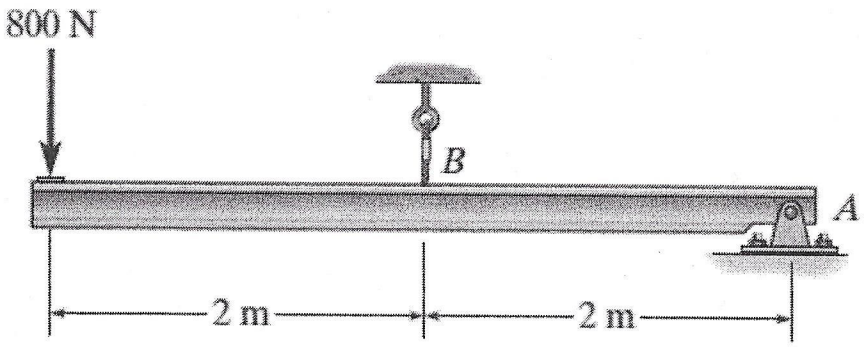
MAAE 2101 DYNAMICS – Class Quiz – 8% - L3 & L4 – Friday Dec. 01 – 2:30 to 3:30 am

Last Name: _____ *First Name:*_____ *LAB /PA* :_____

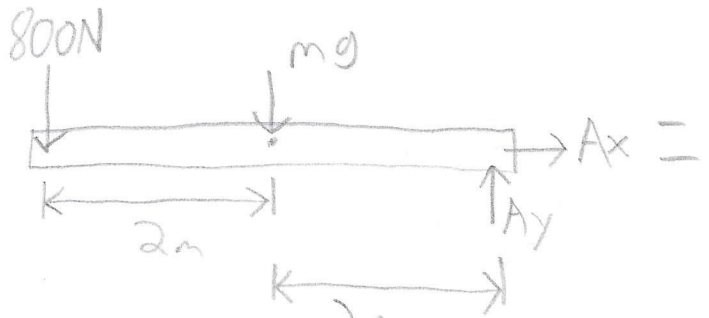
Important: The LAB session (L1, L2, …) is required (to get the marked assignment back by your TA

If the cord at B suddenly fails, determine the horizontal and vertical components of the initial reaction at the pin A, and the angular acceleration of the 120-kg beam. Treat the beam as a uniform slender rod.

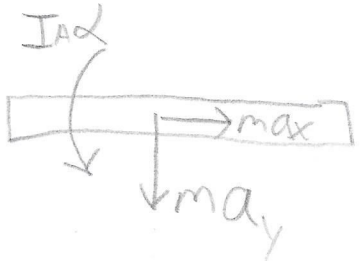


Immediately after cord fails:

FBD



IRD



Note: fixed @ A, ∴ $a_x = a_n = \omega^2 r = 0$

$a_y = a_t = \alpha r = 2\alpha$ (1)

$\circlearrowleft + \sum M_A = I_G\alpha + \sum ma_G r = 800r_F + mgr_a$

$(800)(4) + (120)(9.81)(2) = \frac{1}{12}(120)(4)^2\alpha + (120)a_y(2)$

$5554.4 = 160\alpha + 240a_y$ (2)

$\downarrow + \sum F_y = ma_y = 800 + mg - A_y$

$800 + (120)(9.81) - A_y = ma_{G_y}$

$1977.2 - A_y = 120\,a_{G_y}$ (3)

Solve (1)-(3):

$\alpha = 8.68 \frac{rad}{s^2}$ $a_{G_y} = 17.36 \frac{m}{s^2}$, $A_y = 106\,N$

$\rightarrow + \sum F_x = 0 \rightarrow A_x = 0$