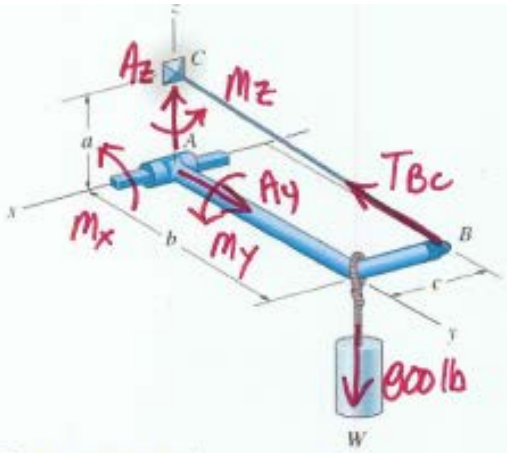
3D Equilibrium I Problem 2

Member ***AB*** is supported by cable ***BC*** and at ***A*** by a ***square*** rod which fits loosely through the ***square*** hole at the end joint of the member as shown. Determine the components of reaction at ***A*** and the tension in the cable needed to hold the cylinder of weight *W*= 800 lb in equilibrium.



NON CONCURRENT
6 EQNS
6 UNKS

ΣM_A TO ELIMINATE $A_z + A_y$

$$\frac{\vec{BC}}{|\vec{BC}|} \times T_{BC} = \frac{[3\ -6\ 2]}{\sqrt{3^2+(-6)^2+2^2}} T_{BC} = \left[\tfrac{3}{7}\ \ -\tfrac{6}{7}\ \ \tfrac{2}{7}\right] T_{BC}$$

FORCES, MOM REACTIONS	$\vec{r}_{PT \to F}$	$\vec{F}$	$\vec{r} \times \vec{F}$ couples + MOMENT REACTIONS
$\vec{M}_A$	———	———	$[M_x\ \ M_y\ \ M_z]$
$\vec{A}$	$[0\ \ 0\ \ 0]$	$[0\ \ A_y\ \ A_z]$	$[0\ \ 0\ \ 0]$
T_{BC}	$[0\ \ 0\ \ 2]$	$\left[\tfrac{3}{7}\ \ -\tfrac{6}{7}\ \ \tfrac{2}{7}\right] T_{BC}$	$[1.714\ \ 0.858\ \ 0] T_{BC}$
800	$[0\ \ 6\ \ 0]$	$[0\ \ 0\ \ -800]$	$[-4800\ \ 0\ \ 0]$

EQUILIBRIUM EQNS

$\Sigma F_x = 0 = 0 + \tfrac{3}{7} T_{BC} + 0 \Rightarrow T_{BC} = 0$

$\Sigma F_y = 0 = A_y - \tfrac{6}{7} T_{BC} + 0 \Rightarrow A_y = 0$

$\Sigma F_z = 0 = A_z + \tfrac{2}{7} T_{BC} - 800 \Rightarrow A_z = 800$ lb

$\Sigma M_x = 0 = M_x + 1.714 T_{BC} - 4800 \Rightarrow M_x = 4800$ Ft-lbs ($\alpha = 0$)

$\Sigma M_y = 0 = M_y + 0 + .858 T_{BC} + 0 \Rightarrow M_y = 0$

$\Sigma M_z = 0 = M_z + 0 + 0 + 0 \Rightarrow M_z = 0$

$\vec{A} = [0\ \ 0\ \ 800]$ lbs

$\vec{M}_A = [4800\ \ 0\ \ 0]$ Ft-lbs

$T_{BC} = 0$