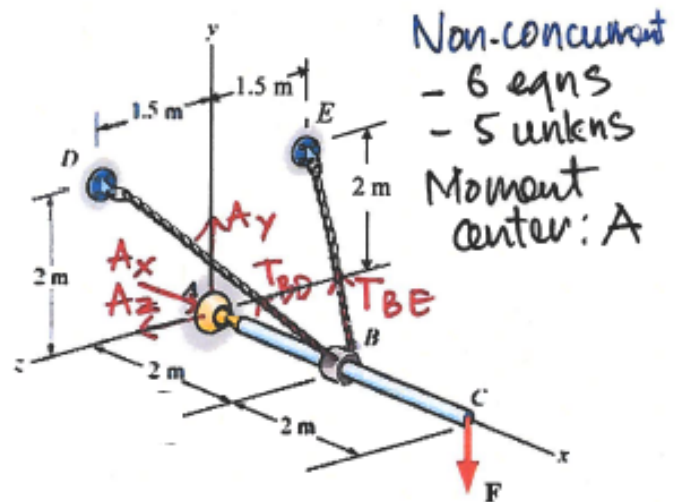


EGM 3420C - Engineering Mechanics

Statics Review 1 Problems

Problem 6

The boom ABC is subjected to a force $F = 8 \text{ kN}$ downward at C and is supported by a ball and socket at A and the cables BD and BE . Determine the tension in the cables and the reactions at A .



$$B(2, 0, 0) \quad C(4, 0, 0)$$

$$D(0, 2, 1.5) \quad E(0, 2, -1.5)$$

$$\hat{u}_{BD} = \frac{[-2 \ 2 \ 1.5]}{3.202} = [-.624 \ .624 \ .469]$$

$$\hat{u}_{BE} = \frac{[-2 \ 2 \ -1.5]}{3.202} = [-.624 \ .624 \ -.469]$$

Forces, moment rxns	$\vec{r}_{F/A}$	\vec{F}	Moments, $\vec{r} \times \vec{F}$
rxns @ A	$[0 \ 0 \ 0]$	$[A_x \ A_y \ A_z]$	$[0 \ 0 \ 0]$
$F = 8 \text{ kN}$	$[4 \ 0 \ 0]$	$[0 \ -8 \ 0]$	$[0 \ 0 \ -32]$
T_{BD}	$[2 \ 0 \ 0]$	$[-.624 \ .624 \ .469]T_{BD}$	$[0 \ -.938 \ 1.248]T_{BD}$
T_{BE}	$[2 \ 0 \ 0]$	$[-.624 \ .624 \ -.469]T_{BE}$	$[0 \ .938 \ 1.248]T_{BE}$

$$\sum M_y = 0 = -.938T_{BD} + .938T_{BE} \Rightarrow T_{BD} = T_{BE} \quad T_{BD} = T_{BE} = \underline{12.82 \text{ kN}}$$

$$\sum M_z = 0 = -32 + 1.248T_{BD} + 1.248T_{BE}$$

$$\sum F_x = 0 \Rightarrow A_x = +.624(T_{BD} + T_{BE}) \Rightarrow A_x = \underline{16.00 \text{ kN}}$$

$$\sum F_y = 0 \Rightarrow A_y = 8 - .624(T_{BD} + T_{BE}) \Rightarrow A_y = \underline{-8.00 \text{ kN}}$$

$$\sum F_z = 0 \Rightarrow A_z = -.469T_{BD} + .469T_{BE} \Rightarrow \underline{A_z = 0}$$

ANSWER:

$$T_{BD} = T_{BE} = 12.82 \text{ kN} ; A = [16.00 \ -8.00 \ 0] \text{ kN}$$