

PROBLEM AP-10

GIVEN:

Determine the components of \mathbf{F} that act along rod AC and perpendicular to it. Point B is located at the midpoint of the rod.

REQUIRED:

$$F_{\parallel AC}$$

$$F_{\perp AC}$$

SOLUTION:

$$\vec{AC} = \{-3\hat{i} + 4\hat{j} - 4\hat{k}\} \text{ m}$$

$$\hat{e}_{AC} = \frac{\vec{AC}}{|\vec{AC}|} = \left\{ \frac{-3}{\sqrt{41}}\hat{i} + \frac{4}{\sqrt{41}}\hat{j} - \frac{4}{\sqrt{41}}\hat{k} \right\} = \hat{e}_{BC}$$

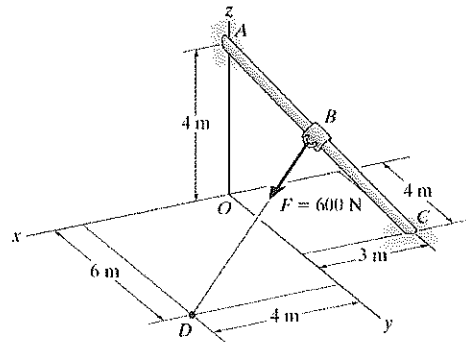
$$\vec{AB} = \frac{1}{2} \vec{AC} = \{-1.5\hat{i} + 2\hat{j} - 2\hat{k}\} \text{ m}$$

$$\vec{r}_{AB} + \vec{r}_{BD} = \vec{r}_{AD} \quad \vec{r}_{BD} = \{5.5\hat{i} + 4\hat{j} - 2\hat{k}\} \text{ m}$$

$$\vec{F} = F \frac{\vec{r}_{BD}}{|\vec{r}_{BD}|} = \{466\hat{i} + 339\hat{j} - 169\hat{k}\} \text{ N}$$

$$F_{\parallel AC} = \vec{F} \cdot \hat{e}_{AC} = 99.1 \text{ N}$$

$$F_{\perp AC} = \sqrt{F^2 - F_{\parallel AC}^2} = 592 \text{ N}$$



$$F_{\parallel AC} = 99 \text{ N}$$

$$F_{\perp AC} = 592 \text{ N}$$