PROBLEM AP-18
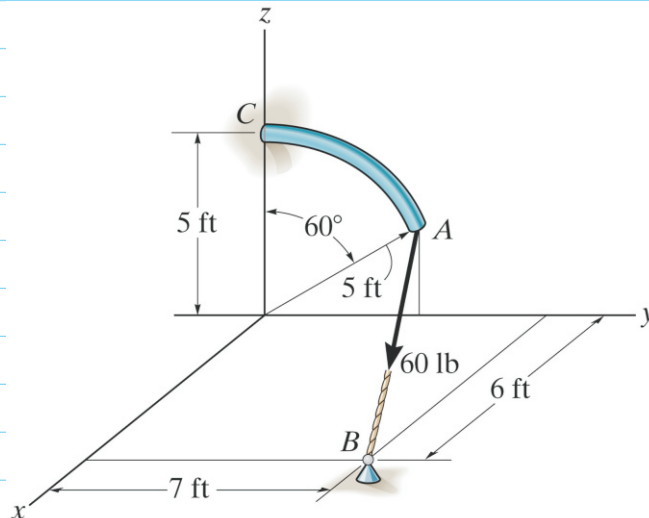
GIVEN:

The curved rod has a radius of 5 ft. If a force of 60 lb acts at its end as shown, determine the moment of this force about point C.

REQUIRED:

SOLUTION:

SOLUTION

Position Vector and Force Vector:

$$r_{CA} = \{(5 \sin 60° - 0)j + (5 \cos 60° - 5)k\} \text{ m}$$

$$= \{4.330j - 2.50k\} \text{ m}$$

$$F_{AB} = 60\left(\frac{(6 - 0)i + (7 - 5 \sin 60°)j + (0 - 5 \cos 60°)k}{\sqrt{(6 - 0)^2 + (7 - 5 \sin 60°)^2 + (0 - 5 \cos 60°)^2}}\right) \text{ lb}$$

$$= \{51.231i + 22.797j - 21.346k\} \text{ lb}$$

Moment of Force F_{AB} About Point C: Applying Eq. 4–7, we have

$$M_C = r_{CA} \times F_{AB}$$

$$= \begin{vmatrix} i & j & k \\ 0 & 4.330 & -2.50 \\ 51.231 & 22.797 & -21.346 \end{vmatrix}$$

$$= \{-35.4i - 128j - 222k\} \text{ lb} \cdot \text{ft}$$