

problem 4-88

If the resultant couple of the two couples acting on the fire hydrant is $\vec{M}_R = \{-15\hat{i} + 30\hat{j}\}$ N.m, determine the force magnitude P .

Solution:

Find the moments using scalar analysis and then

Show the moments as

Vectors:

The two 75 N forces create a moment

along $-X$ direction.

The two other forces (P & $-P$) create a moment along $+Y$ axis: $M = F \cdot d$

$$\left. \begin{array}{l} M_1 = 75 \times 0.2 = 15 \\ M_2 = P \times 0.15 \end{array} \right\} \rightarrow \vec{M}_C = -15\hat{i} + 0.15P\hat{j} \text{ N.m}$$

$$\vec{M}_R = -15\hat{i} + 30\hat{j} \text{ given} = -15\hat{i} + 0.15P\hat{j}$$

OK

$$30 = 0.15P \Rightarrow \boxed{P = 200 \text{ N}}$$

