Problem 6-117

The tractor boom supports the uniform mass \( m_1 \) in the bucket which has a center of mass at \( G \). Determine the force in each hydraulic cylinder \( AB \) and \( CD \) and the resultant force at pins \( E \) and \( F \). The load is supported equally on each side of the tractor by a similar mechanism.

Units Used: \( \text{kN} := 10^3 \text{N} \)

\[
g_{\text{grav}} := 9.81 \frac{\text{m}}{\text{s}^2}
\]

\( \text{kg} := 1000 \text{gm} \)

Given:

\[
m_1 := 500 \text{kg}
\]

\[
a := 0.1 \text{m} \quad f := 1.25 \text{m}
\]

\[
b := 0.3 \text{m} \quad g := 0.6 \text{m}
\]

\[
c := 1.5 \text{m} \quad h := 0.3 \text{m}
\]

\[
d := 0.25 \text{m} \quad i := 0.4 \text{m}
\]

\[
e := 0.2 \text{m}
\]

Solution:
Problem 6-120

Determine the required force $P$ that must be applied at the blade of the pruning shears so that the blade exerts a normal force of $F$ on the twig at $E$.

Units Used:

Given:

- $F := 20\text{lb}$
- $a := 0.5\text{in}$
- $b := 4\text{in}$
- $c := 0.75\text{in}$
- $d := 0.75\text{in}$
- $e := 1\text{in}$
Problem 7-11

Determine the shear force and moment acting at a section passing through point \( C \) in the beam.

Units Used:

\( \text{kip} := 10^3 \text{lb} \)

Given:

\( w := \frac{3 \text{ kip}}{\text{ft}} \)

\( a := 6 \text{ft} \)

\( b := 18 \text{ft} \)
Problem 7-16

The strongback or lifting beam is used for materials handling. If the suspended load has weight $W$ and a center of gravity of $G$, determine the placement $d$ of the padeyes on the top of the beam so that there is no moment developed within the length $AB$ of the beam. The lifting bridle has two legs that are positioned at angle $\theta$ as shown.

Units Used:

kN $:= 1000\text{N}$

Given:

$W := 2\text{kN}$

$\theta := 45\text{deg}$

$a := 0.2\text{m}$

$b := 3\text{m}$

Solution:

Support Reactions: From FBD (a),
Problem 7-59

Draw the shear and moment diagrams for the beam.

Units Used: \( \text{kip} := 1000 \text{lb} \)

Given: \( w := \frac{4 \text{ kip}}{\text{ft}} \) \( a := 12 \text{ ft} \)

\( b := 12 \text{ ft} \)