7-1* Use the method of joints to determine the force in each member of the truss shown in Fig. P7-1. State whether each member is in tension or compression.

SOLUTION

For this simple truss, the member forces can be determined without solving for the support reactions.

From a free-body diagram for joint B:

\[ + \sum F_x = T_{BC} + 2000 \cos 30^\circ = 0 \]
\[ T_{BC} = -1732.1 \text{ lb} \approx 1732 \text{ lb (C)} \quad \text{Ans.} \]

\[ + \sum F_y = 2000 \sin 30^\circ - T_{AB} = 0 \]
\[ T_{AB} = 1000 \text{ lb} = 1000 \text{ lb (T)} \quad \text{Ans.} \]

From a free-body diagram for joint C:

\[ + \sum F_x = -T_{BC} \cos 30^\circ - T_{AC} \]
\[ = -(-1732.1) - T_{AC} = 0 \]
\[ T_{AC} = 1500 \text{ lb} = 1500 \text{ lb (T)} \quad \text{Ans.} \]
7-17* A crate weighing 4000 lb is attached by light, inextensible cables to the truss of Fig. P7-17. Determine the force in each member of the truss. State whether each member is in tension or compression.

**SOLUTION**

From a free-body diagram for the complete truss:

\[ \sum M_A = E(6) - 2000(4) - 2000(8) = 0 \]
\[ E = 4000 \text{ lb} = 4000 \text{ lb} \rightarrow \]
\[ \rightarrow \sum F_x = A_x + 4000 = 0 \]
\[ A_x = -4000 \text{ lb} = 4000 \text{ lb} \leftarrow \]
\[ \uparrow \sum F_y = A_y - 2000 - 2000 = 0 \]
\[ A_y = 4000 \text{ lb} = 4000 \text{ lb} \uparrow \]

From a free-body diagram for joint C:

\[ \phi = \tan^{-1} \frac{6}{8} = 36.87^\circ \]
\[ \rightarrow \sum F_x = -T_{CD} - T_{BC} \cos 36.87^\circ = 0 \]
\[ \uparrow \sum F_y = T_{BC} \sin 36.87^\circ - 2000 = 0 \]
\[ T_{BC} = 3333 \text{ lb} \cong 3330 \text{ lb (T)} \quad \text{Ans.} \]
\[ T_{CD} = -2666 \text{ lb} \cong 2670 \text{ lb (C)} \quad \text{Ans.} \]