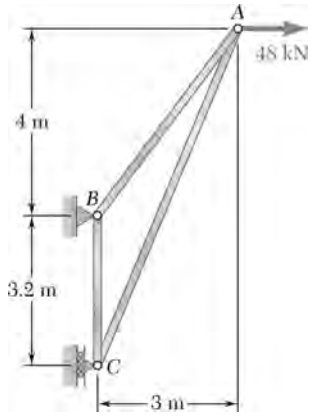


Using the method of joints, determine the force in each member of the truss shown. State whether each member is in tension or compression.

SOLUTION

Free body: Entire truss:

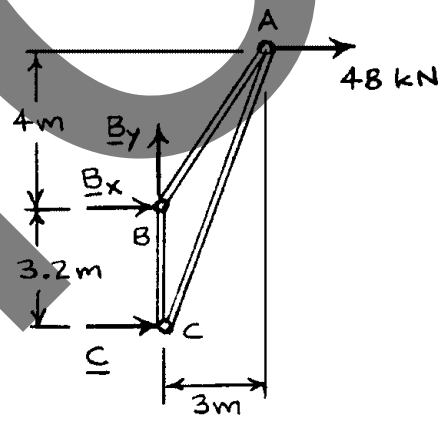
$$+\uparrow \Sigma F_y = 0: \quad B_y = 0 \qquad \mathbf{B}_y = 0$$

$$+\circlearrowleft \Sigma M_C = 0: \quad -B_x(3.2\text{ m}) - (48\text{ kN})(7.2\text{ m}) = 0$$

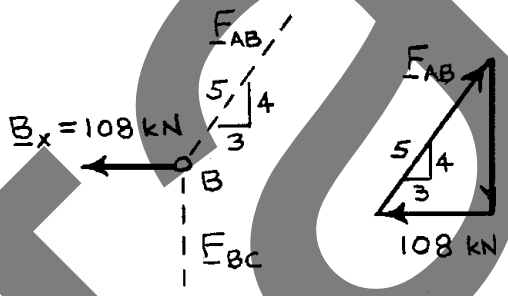
$$B_x = -108\text{ kN} \qquad \mathbf{B}_x = 108\text{ kN} \leftarrow$$

$$\pm \Sigma F_x = 0: \quad C - 108\text{ kN} + 48\text{ kN} = 0$$

$$C = 60\text{ kN} \qquad \mathbf{C} = 60\text{ kN} \rightarrow$$



Free body: Joint *B*:

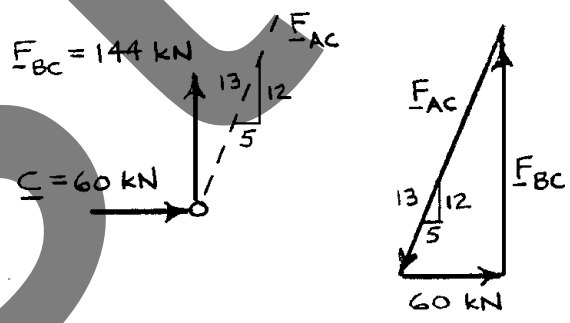


$$\frac{F_{AB}}{5} = \frac{F_{BC}}{4} = \frac{108\text{ kN}}{3}$$

$$F_{AB} = 180.0\text{ kN} \quad T \blacktriangleleft$$

$$F_{BC} = 144.0\text{ kN} \quad T \blacktriangleleft$$

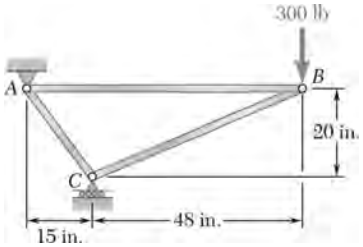
Free body: Joint *C*:



$$\frac{F_{AC}}{13} = \frac{F_{BC}}{12} = \frac{60\text{ kN}}{5}$$

$$F_{AC} = 156.0\text{ kN} \quad C \blacktriangleleft$$

$$F_{BC} = 144\text{ kN} \quad \text{(checks)}$$



Using the method of joints, determine the force in each member of the truss shown. State whether each member is in tension or compression.

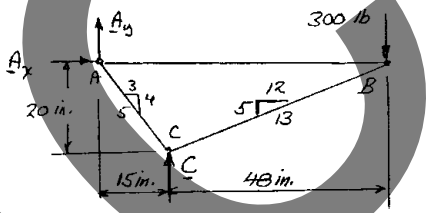
SOLUTION

Reactions:

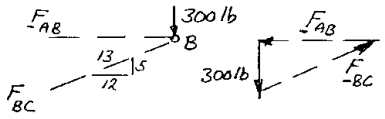
$$\Sigma M_A = 0: \quad \mathbf{C} = 1260 \text{ lb} \uparrow$$

$$\Sigma F_x = 0: \quad \mathbf{A}_x = 0$$

$$\Sigma F_y = 0: \quad \mathbf{A}_y = 960 \text{ lb} \downarrow$$



Joint *B*:

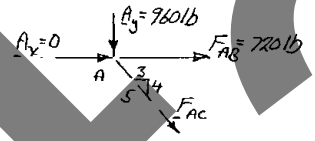


$$\frac{F_{AB}}{12} = \frac{F_{BC}}{13} = \frac{300 \text{ lb}}{5}$$

$$F_{AB} = 720 \text{ lb} \quad T \blacktriangleleft$$

$$F_{BC} = 780 \text{ lb} \quad C \blacktriangleleft$$

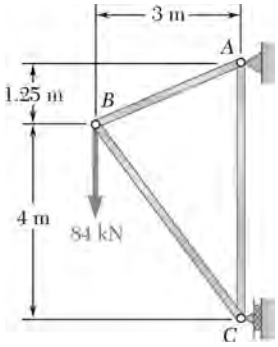
Joint *A*:



$$+\uparrow \Sigma F_y = 0: \quad -960 \text{ lb} - \frac{4}{5} F_{AC} = 0$$

$$F_{AC} = 1200 \text{ lb} \qquad F_{AC} = 1200 \text{ lb} \quad C \blacktriangleleft$$

$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad 720 \text{ lb} - (1200 \text{ lb}) \frac{3}{5} = 0 \quad \text{(checks)}$$

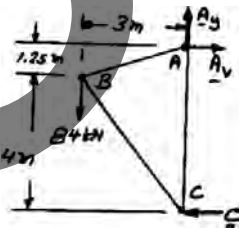


Using the method of joints, determine the force in each member of the truss shown. State whether each member is in tension or compression.

SOLUTION

$$AB = \sqrt{3^2 + 1.25^2} = 3.25 \text{ m}$$

$$BC = \sqrt{3^2 + 4^2} = 5 \text{ m}$$



Reactions:

$$+\circlearrowleft \Sigma M_A = 0: \quad (84 \text{ kN})(3 \text{ m}) - C(5.25 \text{ m}) = 0$$

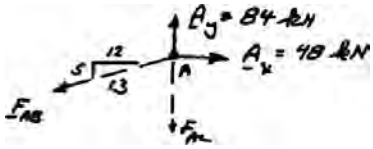
$$\mathbf{C} = 48 \text{ kN} \leftarrow$$

$$\pm \Sigma F_x = 0: \quad A_x - C = 0$$

$$\mathbf{A}_x = 48 \text{ kN} \rightarrow$$

$$+\uparrow \Sigma F_y = 0: \quad A_y = 84 \text{ kN} = 0$$

$$\mathbf{A}_y = 84 \text{ kN} \uparrow$$



Joint *A*:

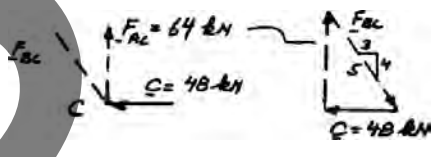
$$\pm \Sigma F_x = 0: \quad 48 \text{ kN} - \frac{12}{13} F_{AB} = 0$$

$$F_{AB} = +52 \text{ kN} \qquad F_{AB} = 52.0 \text{ kN} \quad T \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad 84 \text{ kN} - \frac{5}{13}(52 \text{ kN}) - F_{AC} = 0$$

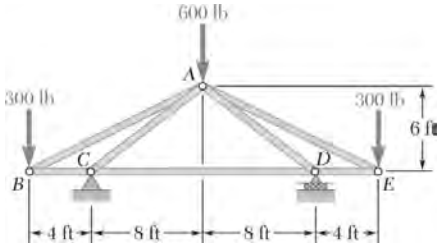
$$F_{AC} = +64.0 \text{ kN} \qquad F_{AC} = 64.0 \text{ kN} \quad T \blacktriangleleft$$

Joint *C*:



$$\frac{F_{BC}}{5} = \frac{48 \text{ kN}}{3}$$

$$F_{BC} = 80.0 \text{ kN} \quad C \blacktriangleleft$$

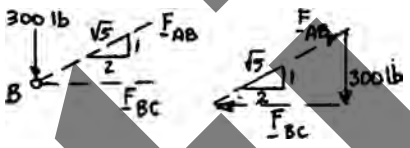


Using the method of joints, determine the force in each member of the truss shown. State whether each member is in tension or compression.

SOLUTION

Free body: Truss:

From the symmetry of the truss and loading, we find $\mathbf{C} = \mathbf{D} = 600 \text{ lb} \uparrow$

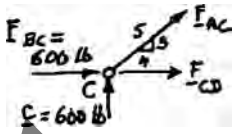


Free body: Joint *B*:

$$\frac{F_{AB}}{\sqrt{5}} = \frac{F_{BC}}{2} = \frac{300 \text{ lb}}{1}$$

$$F_{AB} = 671 \text{ lb} \quad T \qquad F_{BC} = 600 \text{ lb} \quad C \blacktriangleleft$$

Free body: Joint *C*:



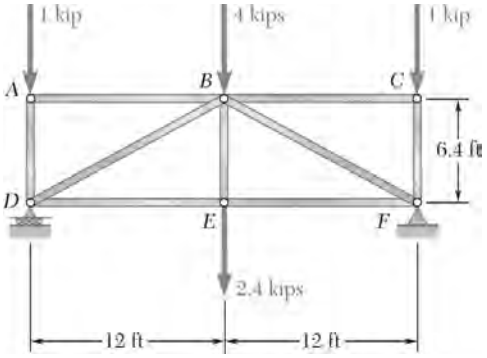
$$+\uparrow \Sigma F_y = 0: \quad \frac{3}{5} F_{AC} + 600 \text{ lb} = 0$$

$$F_{AC} = -1000 \text{ lb} \qquad F_{AC} = 1000 \text{ lb} \quad C \blacktriangleleft$$

$$\pm \rightarrow \Sigma F_x = 0: \quad \frac{4}{5}(-1000 \text{ lb}) + 600 \text{ lb} + F_{CD} = 0 \qquad F_{CD} = 200 \text{ lb} \quad T \blacktriangleleft$$

From symmetry:

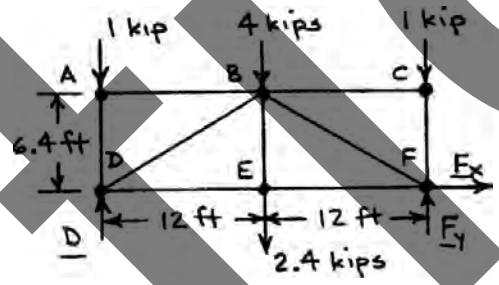
$$F_{AD} = F_{AC} = 1000 \text{ lb} \quad C, \quad F_{AE} = F_{AB} = 671 \text{ lb} \quad T, \quad F_{DE} = F_{BC} = 600 \text{ lb} \quad C \blacktriangleleft$$



Using the method of joints, determine the force in each member of the truss shown. State whether each member is in tension or compression.

SOLUTION

Reactions:



$+\circlearrowleft \Sigma M_D = 0: \quad F_y(24) - (4+2.4)(12) - (1)(24) = 0$

$$\mathbf{F}_y = 4.2 \text{ kips} \uparrow$$

$\Sigma F_x = 0: \quad \mathbf{F}_x = 0$

$+\uparrow \Sigma F_y = 0: \quad D - (1+4+1+2.4) + 4.2 = 0$

$$\mathbf{D} = 4.2 \text{ kips} \uparrow$$

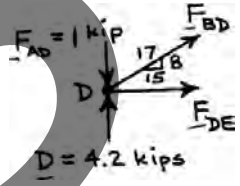
Joint *A*:

$\Sigma F_x = 0: \quad F_{AB} = 0$ $\qquad F_{AB} = 0$ ◀

$+\uparrow \Sigma F_y = 0: \quad -1 - F_{AD} = 0$

$F_{AD} = -1 \text{ kip}$ $\qquad F_{AD} = 1.000 \text{ kip} \quad C$ ◀

Joint *D*:



$+\uparrow \Sigma F_y = 0: \quad -1 + 4.2 + \frac{8}{17} F_{BD} = 0$

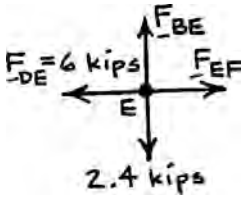
$F_{BD} = -6.8 \text{ kips}$ $\qquad F_{BD} = 6.80 \text{ kips} \quad C$ ◀

$\pm \rightarrow \Sigma F_x = 0: \quad \frac{15}{17}(-6.8) + F_{DE} = 0$

$F_{DE} = +6 \text{ kips}$ $\qquad F_{DE} = 6.00 \text{ kips} \quad T$ ◀

PROBLEM (Continued)

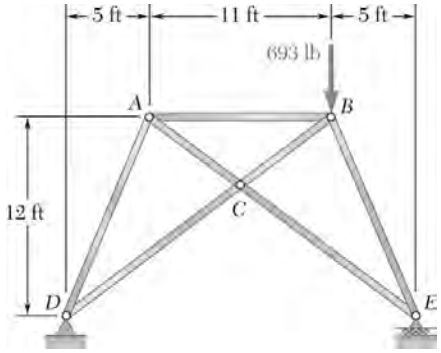
Joint *E*:



$$+\uparrow \Sigma F_y = 0: \quad F_{BE} - 2.4 = 0$$

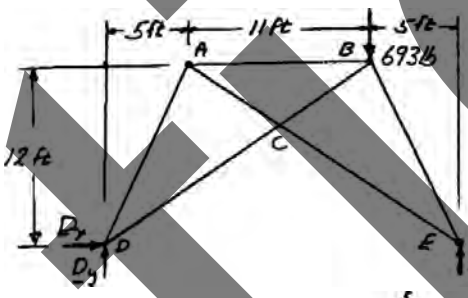
$$F_{BE} = +2.4 \text{ kips} \qquad F_{BE} = 2.40 \text{ kips} \quad T \blacktriangleleft$$

Truss and loading symmetrical about ℄.



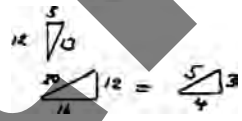
Using the method of joints, determine the force in each member of the truss shown. State whether each member is in tension or compression.

SOLUTION



$$AD = \sqrt{5^2 + 12^2} = 13 \text{ ft}$$

$$BCD = \sqrt{12^2 + 16^2} = 20 \text{ ft}$$



Reactions:

$$\Sigma F_x = 0: \quad D_x = 0$$

$$+\circlearrowleft \Sigma M_E = 0: \quad D_y(21 \text{ ft}) - (693 \text{ lb})(5 \text{ ft}) = 0 \qquad \mathbf{D}_y = 165 \text{ lb} \uparrow$$

$$+\uparrow \Sigma F_y = 0: \quad 165 \text{ lb} - 693 \text{ lb} + E = 0 \qquad \mathbf{E} = 528 \text{ lb} \uparrow$$

Joint *D*:

$$\overset{+}{\leftarrow} \Sigma F_x = 0: \quad \frac{5}{13} F_{AD} + \frac{4}{5} F_{DC} = 0 \qquad (1)$$

$$+\uparrow \Sigma F_y = 0: \quad \frac{12}{13} F_{AD} + \frac{3}{5} F_{DC} + 165 \text{ lb} = 0 \qquad (2)$$

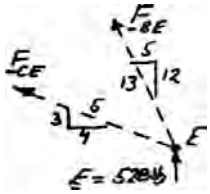
Solving Eqs. (1) and (2) simultaneously,

$$F_{AD} = -260 \text{ lb} \qquad F_{AD} = 260 \text{ lb} \quad C \blacktriangleleft$$

$$F_{DC} = +125 \text{ lb} \qquad F_{DC} = 125 \text{ lb} \quad T \blacktriangleleft$$

PROBLEM (Continued)

Joint *E*:



$$\stackrel{+}{\leftarrow} \Sigma F_x = 0: \quad \frac{5}{13}F_{BE} + \frac{4}{5}F_{CE} = 0 \tag{3}$$

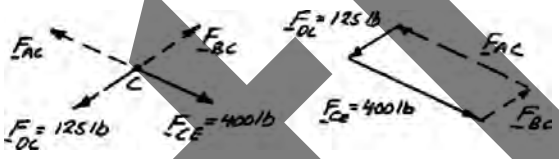
$$+\uparrow \Sigma F_y = 0: \quad \frac{12}{13}F_{BE} + \frac{3}{5}F_{CE} + 528 \text{ lb} = 0 \tag{4}$$

Solving Eqs. (3) and (4) simultaneously,

$$F_{BE} = -832 \text{ lb} \qquad F_{BE} = 832 \text{ lb} \quad C \blacktriangleleft$$

$$F_{CE} = +400 \text{ lb} \qquad F_{CE} = 400 \text{ lb} \quad T \blacktriangleleft$$

Joint *C*:



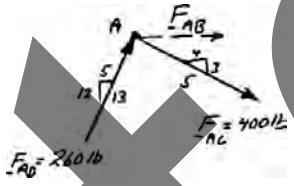
Force polygon is a parallelogram (see Fig. 6.11, p. 209).

$$F_{AC} = 400 \text{ lb} \quad T \blacktriangleleft$$

$$F_{BC} = 125.0 \text{ lb} \quad T \blacktriangleleft$$

Joint *A*:

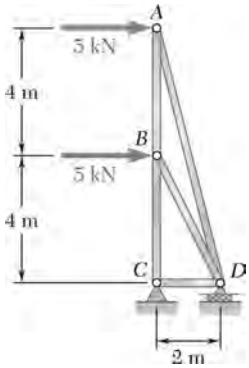
$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad \frac{5}{13}(260 \text{ lb}) + \frac{4}{5}(400 \text{ lb}) + F_{AB} = 0$$



$$F_{AB} = -420 \text{ lb} \qquad F_{AB} = 420 \text{ lb} \quad C \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad \frac{12}{13}(260 \text{ lb}) - \frac{3}{5}(400 \text{ lb}) = 0$$

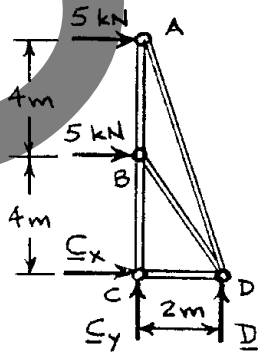
$$0 = 0 \quad \text{(Checks)}$$



Using the method of joints, determine the force in each member of the truss shown. State whether each member is in tension or compression.

SOLUTION

Free body: Entire truss:



$$\overset{+}{\rightarrow}\Sigma F_x = 0: \quad C_x + 2(5\text{ kN}) = 0$$

$$C_x = -10\text{ kN} \qquad \bar{\mathbf{C}}_x = 10\text{ kN} \leftarrow$$

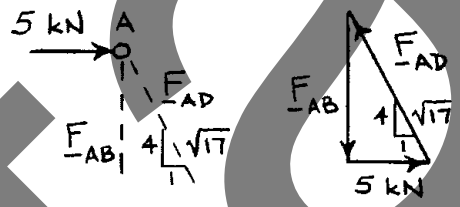
$$+\circlearrowleft \Sigma M_C = 0: \quad D(2\text{ m}) - (5\text{ kN})(8\text{ m}) - (5\text{ kN})(4\text{ m}) = 0$$

$$D = +30\text{ kN} \qquad \bar{\mathbf{D}} = 30\text{ kN} \uparrow$$

$$+\uparrow \Sigma F_y = 0: \quad C_y + 30\text{ kN} = 0 \quad C_y = -30\text{ kN} \quad \bar{\mathbf{C}}_y = 30\text{ kN} \downarrow$$

Free body: Joint *A*:

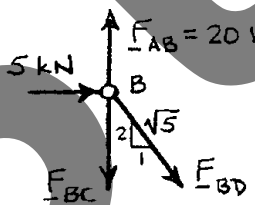
$$\frac{F_{AB}}{4} = \frac{F_{AD}}{\sqrt{17}} = \frac{5\text{ kN}}{1}$$



$F_{AB} = 20.0\text{ kN} \quad T$ ◀

$F_{AD} = 20.6\text{ kN} \quad C$ ◀

Free body: Joint *B*:



$$\overset{+}{\rightarrow}\Sigma F_x = 0: \quad 5\text{ kN} + \frac{1}{\sqrt{5}} F_{BD} = 0$$

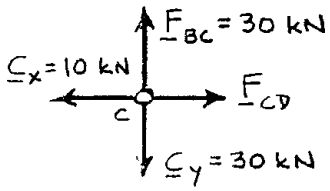
$$F_{BD} = -5\sqrt{5}\text{ kN} \qquad F_{BD} = 11.18\text{ kN} \quad C$$ ◀

$$+\uparrow \Sigma F_y = 0: \quad 20\text{ kN} - F_{BC} - \frac{2}{\sqrt{5}}(-5\sqrt{5}\text{ kN}) = 0$$

$$F_{BC} = +30\text{ kN} \qquad F_{BC} = 30.0\text{ kN} \quad T$$ ◀

PROBLEM(Continued)

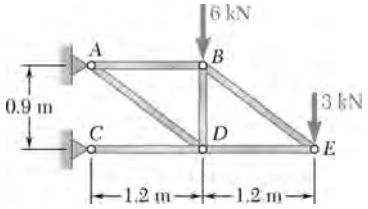
Free body: Joint *C*:



$\overset{+}{\rightarrow} \Sigma F_x = 0: \quad F_{CD} - 10 \text{ kN} = 0$

$F_{CD} = +10 \text{ kN}$ $\qquad F_{CD} = 10.00 \text{ kN} \quad T \blacktriangleleft$

$+\uparrow \Sigma F_y = 0: \quad 30 \text{ kN} - 30 \text{ kN} = 0 \quad \text{(checks)}$



PROBLEM 6.8

Using the method of joints, determine the force in each member of the truss shown. State whether each member is in tension or compression.

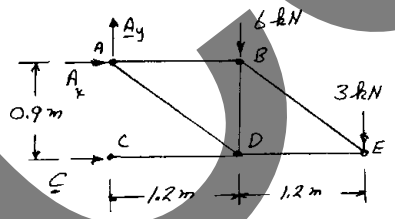
SOLUTION

Reactions:

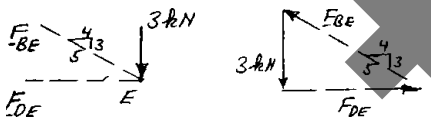
$$\Sigma M_C = 0: \quad \mathbf{A}_x = 16 \text{ kN} \leftarrow$$

$$\Sigma F_y = 0: \quad \mathbf{A}_y = 9 \text{ kN} \uparrow$$

$$\Sigma F_x = 0: \quad \mathbf{C} = 16 \text{ kN} \rightarrow$$



Joint *E*:

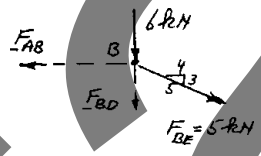


$$\frac{F_{BE}}{5} = \frac{F_{DE}}{4} = \frac{3 \text{ kN}}{3}$$

$$F_{BE} = 5.00 \text{ kN} \quad T \blacktriangleleft$$

$$F_{DE} = 4.00 \text{ kN} \quad C \blacktriangleleft$$

Joint *B*:



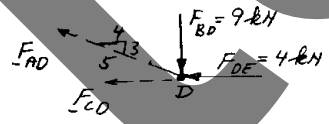
$$\pm \rightarrow \Sigma F_x = 0: \quad \frac{4}{5}(5 \text{ kN}) - F_{AB} = 0$$

$$F_{AB} = +4 \text{ kN} \qquad F_{AB} = 4.00 \text{ kN} \quad T \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad -6 \text{ kN} - \frac{3}{5}(5 \text{ kN}) - F_{BD} = 0$$

$$F_{BD} = -9 \text{ kN} \qquad F_{BD} = 9.00 \text{ kN} \quad C \blacktriangleleft$$

Joint *D*:

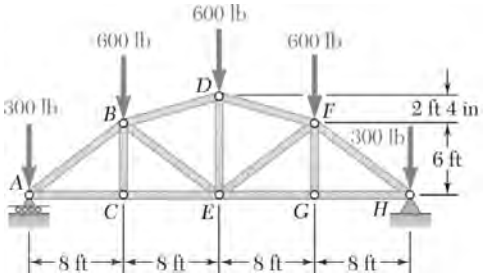


$$+\uparrow \Sigma F_y = 0: \quad -9 \text{ kN} + \frac{3}{5}F_{AD} = 0$$

$$F_{AD} = +15 \text{ kN} \qquad F_{AD} = 15.00 \text{ kN} \quad T \blacktriangleleft$$

$$\pm \rightarrow \Sigma F_x = 0: \quad -4 \text{ kN} - \frac{4}{5}(15 \text{ kN}) - F_{CD} = 0$$

$$F_{CD} = -16 \text{ kN} \qquad F_{CD} = 16.00 \text{ kN} \quad C \blacktriangleleft$$



Determine the force in each member of the Gambrel roof truss shown. State whether each member is in tension or compression.

SOLUTION

Free body: Truss:

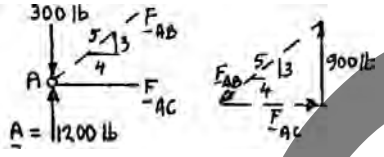
$$\Sigma F_x = 0: \quad \mathbf{H}_x = 0$$

Because of the symmetry of the truss and loading,

$$\mathbf{A} = \mathbf{H}_y = \frac{1}{2}\text{total load}$$

$$\mathbf{A} = \mathbf{H}_y = 1200\text{ lb} \uparrow$$

Free body: Joint *A*:

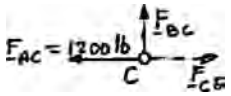


$$\frac{F_{AB}}{5} = \frac{F_{AC}}{4} = \frac{900\text{ lb}}{3}$$

$$\mathbf{F}_{AB} = 1500\text{ lb} \quad C \blacktriangleleft$$

$$\mathbf{F}_{AC} = 1200\text{ lb} \quad T \blacktriangleleft$$

Free body: Joint *C*:

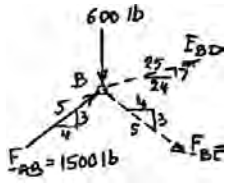


BC is a zero-force member.

$$\mathbf{F}_{BC} = 0$$

$$F_{CE} = 1200\text{ lb} \quad T \blacktriangleleft$$

Free body: Joint *B*:



$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad \frac{24}{25}F_{BD} + \frac{4}{5}F_{BE} + \frac{4}{5}(1500\text{ lb}) = 0$$

or

$$24F_{BD} + 20F_{BE} = -30{,}000\text{ lb} \qquad (1)$$

$$+\uparrow \Sigma F_y = 0: \quad \frac{7}{25}F_{BD} - \frac{3}{5}F_{BE} + \frac{3}{5}(1500) - 600 = 0$$

or

$$7F_{BD} - 15F_{BE} = -7{,}500\text{ lb} \qquad (2)$$

PROBLEM 6.9 (Continued)

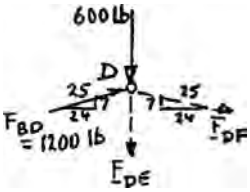
Multiply Eq. (1) by 3, Eq. (2) by 4, and add:

$$100F_{BD} = -120{,}000 \text{ lb} \qquad F_{BD} = 1200 \text{ lb} \quad C \blacktriangleleft$$

Multiply Eq. (1) by 7, Eq. (2) by –24, and add:

$$500F_{BE} = -30{,}000 \text{ lb} \qquad F_{BE} = 60.0 \text{ lb} \quad C \blacktriangleleft$$

Free body: Joint *D*:



$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad \frac{24}{25}(1200 \text{ lb}) + \frac{24}{25}F_{DF} = 0$$

$$F_{DF} = -1200 \text{ lb} \qquad F_{DF} = 1200 \text{ lb} \quad C \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad \frac{7}{25}(1200 \text{ lb}) - \frac{7}{25}(-1200 \text{ lb}) - 600 \text{ lb} - F_{DE} = 0$$

$$F_{DE} = 72.0 \text{ lb} \qquad F_{DE} = 72.0 \text{ lb} \quad T \blacktriangleleft$$

Because of the symmetry of the truss and loading, we deduce that

$$F_{EF} = F_{BE} \qquad F_{EF} = 60.0 \text{ lb} \quad C \blacktriangleleft$$

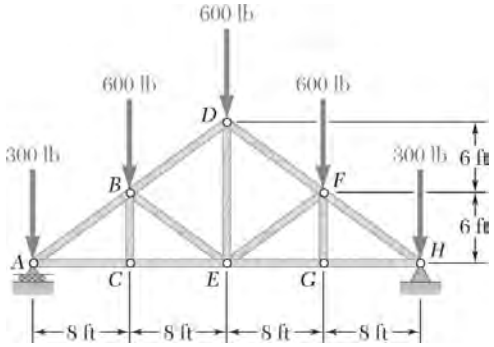
$$F_{EG} = F_{CE} \qquad F_{EG} = 1200 \text{ lb} \quad T \blacktriangleleft$$

$$F_{FG} = F_{BC} \qquad F_{FG} = 0 \blacktriangleleft$$

$$F_{FH} = F_{AB} \qquad F_{FH} = 1500 \text{ lb} \quad C \blacktriangleleft$$

$$F_{GH} = F_{AC} \qquad F_{GH} = 1200 \text{ lb} \quad T \blacktriangleleft$$

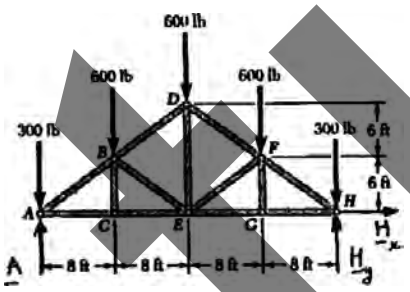
Note: Compare results with those of Problem 6.11.



Determine the force in each member of the Howe roof truss shown. State whether each member is in tension or compression.

SOLUTION

Free body: Truss:



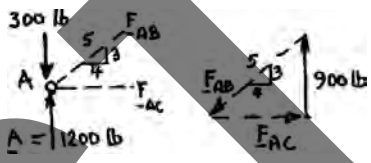
$$\Sigma F_x = 0: \quad \mathbf{H}_x = 0$$

Because of the symmetry of the truss and loading,

$$A = H_y = \frac{1}{2}\text{total load}$$

$$\mathbf{A} = \mathbf{H}_y = 1200\text{ lb} \uparrow$$

Free body: Joint *A*:



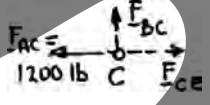
$$\frac{F_{AB}}{5} = \frac{F_{AC}}{4} = \frac{900\text{ lb}}{3}$$

$$\mathbf{F}_{AB} = 1500\text{ lb} \quad C \blacktriangleleft$$

$$\mathbf{F}_{AC} = 1200\text{ lb} \quad T \blacktriangleleft$$

Free body: Joint *C*:

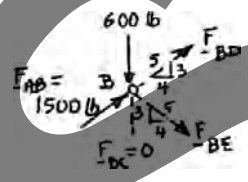
BC is a zero-force member.



$$\mathbf{F}_{BC} = 0$$

$$\mathbf{F}_{CE} = 1200\text{ lb} \quad T \blacktriangleleft$$

PROBLEM 6.10 (Continued)



Free body: Joint *B*:

$$\stackrel{+}{\rightarrow}\Sigma F_x = 0: \quad \frac{4}{5}F_{BD} + \frac{4}{5}F_{BC} + \frac{4}{5}(1500\text{ lb}) = 0$$

or $$F_{BD} + F_{BE} = -1500\text{ lb} \qquad (1)$$

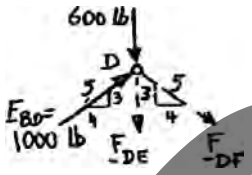
$$+\uparrow \Sigma F_y = 0: \quad \frac{3}{5}F_{BD} - \frac{3}{5}F_{BE} + \frac{3}{5}(1500\text{ lb}) - 600\text{ lb} = 0$$

or $$F_{BD} - F_{BE} = -500\text{ lb} \qquad (2)$$

Add Eqs. (1) and (2): $2F_{BD} = -2000\text{ lb}$ $\qquad F_{BD} = 1000\text{ lb}\ \ C$ ◀

Subtract Eq. (2) from Eq. (1): $2F_{BE} = -1000\text{ lb}$ $\qquad F_{BE} = 500\text{ lb}\ \ C$ ◀

Free Body: Joint *D*:



$$\stackrel{+}{\rightarrow}\Sigma F_x = 0: \quad \frac{4}{5}(1000\text{ lb}) + \frac{4}{5}F_{DF} = 0$$

$$F_{DF} = -1000\text{ lb} \qquad F_{DF} = 1000\text{ lb}\ \ C$$ ◀

$$+\uparrow \Sigma F_y = 0: \quad \frac{3}{5}(1000\text{ lb}) - \frac{3}{5}(-1000\text{ lb}) - 600\text{ lb} - F_{DE} = 0$$

$$F_{DE} = +600\text{ lb} \qquad F_{DE} = 600\text{ lb}\ \ T$$ ◀

Because of the symmetry of the truss and loading, we deduce that

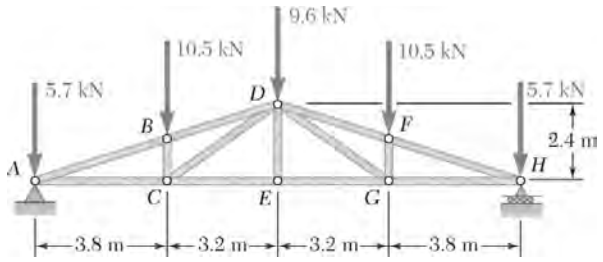
$$F_{EF} = F_{BE} \qquad F_{EF} = 500\text{ lb}\ \ C$$ ◀

$$F_{EG} = F_{CE} \qquad F_{EG} = 1200\text{ lb}\ \ T$$ ◀

$$F_{FG} = F_{BC} \qquad F_{FG} = 0$$ ◀

$$F_{FH} = F_{AB} \qquad F_{FH} = 1500\text{ lb}\ \ C$$ ◀

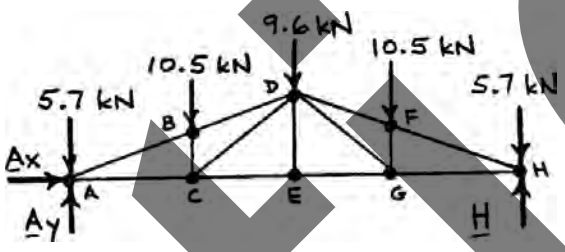
$$F_{GH} = F_{AC} \qquad F_{GH} = 1200\text{ lb}\ \ T$$ ◀



Determine the force in each member of the Pratt roof truss shown. State whether each member is in tension or compression.

SOLUTION

Free body: Truss:

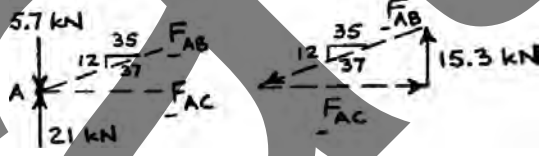


$$\Sigma F_x = 0: \quad A_x = 0$$

Due to symmetry of truss and load,

$$A_y = H = \frac{1}{2} \text{ total load} = 21 \text{ kN} \uparrow$$

Free body: Joint *A*:



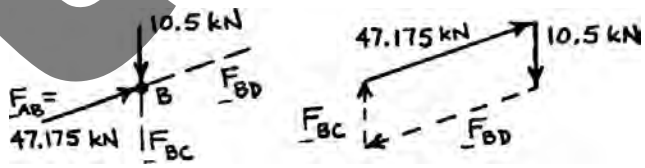
$$\frac{F_{AB}}{37} = \frac{F_{AC}}{35} = \frac{15.3 \text{ kN}}{12}$$

$$F_{AB} = 47.175 \text{ kN} \quad F_{AC} = 44.625 \text{ kN}$$

$F_{AB} = 47.2$ kN C ◀

$F_{AC} = 44.6$ kN T ◀

Free body: Joint *B*:



From force polygon: $F_{BD} = 47.175$ kN, $F_{BC} = 10.5$ kN

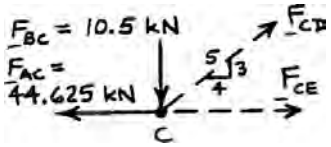
$F_{BC} = 10.50$ kN C ◀

$F_{BD} = 47.2$ kN C ◀

PROBLEM 6.11 (Continued)

Free body: Joint *C*:

$$+\uparrow \Sigma F_y = 0: \quad \frac{3}{5}F_{CD} - 10.5 = 0 \qquad F_{CD} = 17.50 \text{ kN} \quad T \blacktriangleleft$$

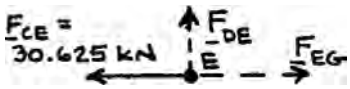


$$\rightarrow \Sigma F_x = 0: \quad F_{CE} + \frac{4}{5}(17.50) - 44.625 = 0$$

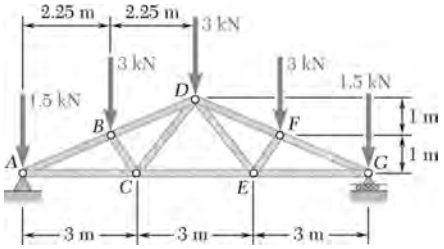
$$F_{CE} = 30.625 \text{ kN} \qquad F_{CE} = 30.6 \text{ kN} \quad T \blacktriangleleft$$

Free body: Joint *E*:

DE is a zero-force member. $F_{DE} = 0 \blacktriangleleft$



Truss and loading symmetrical about ℄.

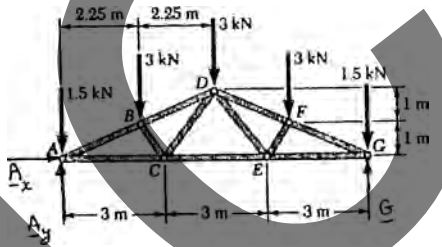


Determine the force in each member of the Fink roof truss shown. State whether each member is in tension or compression.

SOLUTION

Free body: Truss:

$$\Sigma F_x = 0: \quad \mathbf{A}_x = 0$$

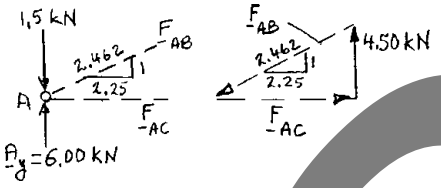


Because of the symmetry of the truss and loading,

$$\mathbf{A}_y = \mathbf{G} = \frac{1}{2} \text{ total load}$$

$$\mathbf{A}_y = \mathbf{G} = 6.00 \text{ kN} \uparrow$$

Free body: Joint *A*:

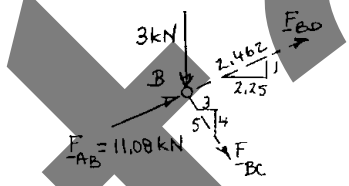


$$\frac{F_{AB}}{2.462} = \frac{F_{AC}}{2.25} = \frac{4.50 \text{ kN}}{1}$$

$$F_{AB} = 11.08 \text{ kN} \quad C \blacktriangleleft$$

$$F_{AC} = 10.125 \text{ kN} \qquad F_{AC} = 10.13 \text{ kN} \quad T \blacktriangleleft$$

Free body: Joint *B*:



$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad \frac{3}{5}F_{BC} + \frac{2.25}{2.462}F_{BD} + \frac{2.25}{2.462}(11.08 \text{ kN}) = 0 \tag{1}$$

$$+\uparrow \Sigma F_y = 0: \quad -\frac{4}{5}F_{BC} + \frac{F_{BD}}{2.462} + \frac{11.08 \text{ kN}}{2.462} - 3 \text{ kN} = 0 \tag{2}$$

Multiply Eq. (2) by –2.25 and add to Eq. (1):

$$\frac{12}{5}F_{BC} + 6.75 \text{ kN} = 0 \qquad F_{BC} = -2.8125 \qquad F_{BC} = 2.81 \text{ kN} \quad C \blacktriangleleft$$

Multiply Eq. (1) by 4, Eq. (2) by 3, and add:

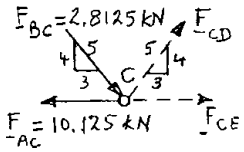
$$\frac{12}{2.462}F_{BD} + \frac{12}{2.462}(11.08 \text{ kN}) - 9 \text{ kN} = 0$$

$$F_{BD} = -9.2335 \text{ kN} \qquad F_{BD} = 9.23 \text{ kN} \quad C \blacktriangleleft$$

PROBLEM (Continued)

Free body: Joint *C*:

$+\uparrow \Sigma F_y = 0$: $\frac{4}{5}F_{CD} - \frac{4}{5}(2.8125\text{ kN}) = 0$



$F_{CD} = 2.8125\text{ kN}, \qquad F_{CD} = 2.81\text{ kN} \quad T$ ◀

$\pm \rightarrow \Sigma F_x = 0$: $F_{CE} - 10.125\text{ kN} + \frac{3}{5}(2.8125\text{ kN}) + \frac{3}{5}(2.8125\text{ kN}) = 0$

$F_{CE} = +6.7500\text{ kN} \qquad F_{CE} = 6.75\text{ kN} \quad T$ ◀

Because of the symmetry of the truss and loading, we deduce that

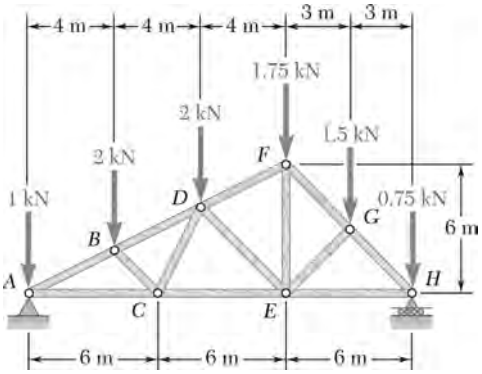
$F_{DE} = F_{CD} \qquad F_{CD} = 2.81\text{ kN} \quad T$ ◀

$F_{DF} = F_{BD} \qquad F_{DF} = 9.23\text{ kN} \quad C$ ◀

$F_{EF} = F_{BC} \qquad F_{EF} = 2.81\text{ kN} \quad C$ ◀

$F_{EG} = F_{AC} \qquad F_{EG} = 10.13\text{ kN} \quad T$ ◀

$F_{FG} = F_{AB} \qquad F_{FG} = 11.08\text{ kN} \quad C$ ◀

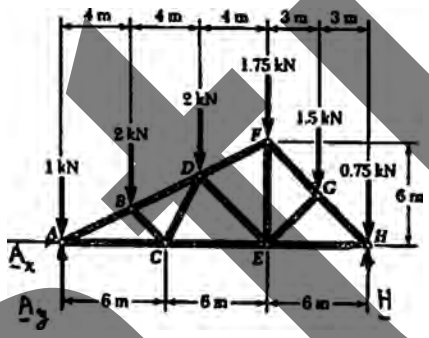


PROBLEM 6.13

Using the method of joints, determine the force in each member of the double-pitch roof truss shown. State whether each member is in tension or compression.

SOLUTION

Free body: Truss:



$+\circlearrowleft \Sigma M_A = 0$: $H(18\text{ m}) - (2\text{ kN})(4\text{ m}) - (2\text{ kN})(8\text{ m}) - (1.75\text{ kN})(12\text{ m})$
$- (1.5\text{ kN})(15\text{ m}) - (0.75\text{ kN})(18\text{ m}) = 0$

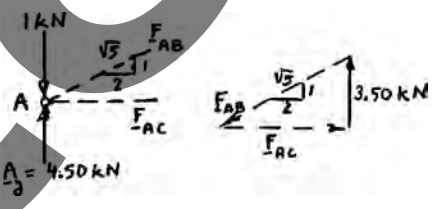
$\mathbf{H} = 4.50\text{ kN} \uparrow$

$\Sigma F_x = 0$: $A_x = 0$

$\Sigma F_y = 0$: $A_y + H - 9 = 0$

$A_y = 9 - 4.50$ $\quad \mathbf{A}_y = 4.50\text{ kN} \uparrow$

Free body: Joint A:



$$\frac{F_{AB}}{\sqrt{5}} = \frac{F_{AC}}{2} = \frac{3.50\text{ kN}}{1}$$

$F_{AB} = 7.8262\text{ kN}$ $\quad C$ $\qquad F_{AB} = 7.83\text{ kN}$ $\quad C$ ◀

$F_{AC} = 7.00\text{ kN}$ $\quad T$ ◀

PROBLEM 6.13 (Continued)

Free body: Joint *B*:

$$\pm\rightarrow \Sigma F_x = 0: \quad \frac{2}{\sqrt{5}}F_{BD} + \frac{2}{\sqrt{5}}(7.8262\text{ kN}) + \frac{1}{\sqrt{2}}F_{BC} = 0$$

or
$$F_{BD} + 0.79057F_{BC} = -7.8262\text{ kN} \qquad (1)$$

$$+\uparrow \Sigma F_y = 0: \quad \frac{1}{\sqrt{5}}F_{BD} + \frac{1}{\sqrt{5}}(7.8262\text{ kN}) - \frac{1}{\sqrt{2}}F_{BC} - 2\text{ kN} = 0$$

or
$$F_{BD} - 1.58114F_{BC} = -3.3541 \qquad (2)$$

Multiply Eq. (1) by 2 and add Eq. (2):

$$3F_{BD} = -19.0065$$

$$F_{BD} = -6.3355\text{ kN} \qquad F_{BD} = 6.34\text{ kN} \quad C \blacktriangleleft$$

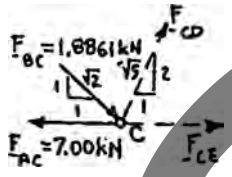
Subtract Eq. (2) from Eq. (1):

$$2.37111F_{BC} = -4.4721$$

$$F_{BC} = -1.8861\text{ kN} \qquad F_{BC} = 1.886\text{ kN} \quad C \blacktriangleleft$$

Free body: Joint *C*:

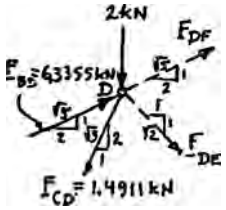
$$+\uparrow \Sigma F_y = 0: \quad \frac{2}{\sqrt{5}}F_{CD} - \frac{1}{\sqrt{2}}(1.8861\text{ kN}) = 0$$



$$F_{CD} = +1.4911\text{ kN} \qquad F_{CD} = 1.491\text{ kN} \quad T \blacktriangleleft$$

$$\pm\rightarrow \Sigma F_x = 0: \quad F_{CE} - 7.00\text{ kN} + \frac{1}{\sqrt{2}}(1.8861\text{ kN}) + \frac{1}{\sqrt{5}}(1.4911\text{ kN}) = 0$$

$$F_{CE} = +5.000\text{ kN} \qquad F_{CE} = 5.00\text{ kN} \quad T \blacktriangleleft$$



Free body: Joint *D*:

$$\pm\rightarrow \Sigma F_x = 0: \quad \frac{2}{\sqrt{5}}F_{DF} + \frac{1}{\sqrt{2}}F_{DE} + \frac{2}{\sqrt{5}}(6.3355\text{ kN}) - \frac{1}{\sqrt{5}}(1.4911\text{ kN}) = 0$$

or
$$F_{DF} + 0.79057F_{DE} = -5.5900\text{ kN} \qquad (1)$$

$$+\uparrow \Sigma F_y = 0: \quad \frac{1}{\sqrt{5}}F_{DF} - \frac{1}{\sqrt{2}}F_{DE} + \frac{1}{\sqrt{5}}(6.3355\text{ kN}) - \frac{2}{\sqrt{5}}(1.4911\text{ kN}) - 2\text{ kN} = 0$$

or
$$F_{DF} - 0.79057F_{DE} = -1.1188\text{ kN} \qquad (2)$$

Add Eqs. (1) and (2):

$$2F_{DF} = -6.7088\text{ kN}$$

$$F_{DF} = -3.3544\text{ kN} \qquad F_{DF} = 3.35\text{ kN} \quad C \blacktriangleleft$$

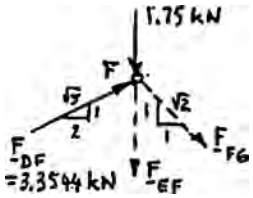
Subtract Eq. (2) from Eq. (1):

$$1.58114F_{DE} = -4.4712\text{ kN}$$

$$F_{DE} = -2.8278\text{ kN} \qquad F_{DE} = 2.83\text{ kN} \quad C \blacktriangleleft$$

PROBLEM 6.13 (Continued)

Free body: Joint *F*:



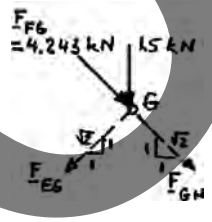
$$\stackrel{+}{\rightarrow}\Sigma F_x = 0: \quad \frac{1}{\sqrt{2}}F_{FG} + \frac{2}{\sqrt{5}}(3.3544\text{ kN}) = 0$$

$$F_{FG} = -4.243\text{ kN} \qquad F_{FG} = 4.24\text{ kN} \quad C \blacktriangleleft$$

$$+\uparrow\Sigma F_y = 0: \quad -F_{EF} - 1.75\text{ kN} + \frac{1}{\sqrt{5}}(3.3544\text{ kN}) - \frac{1}{\sqrt{2}}(-4.243\text{ kN}) = 0$$

$$F_{EF} = 2.750\text{ kN} \qquad F_{EF} = 2.75\text{ kN} \quad T \blacktriangleleft$$

Free body: Joint *G*:



$$\stackrel{+}{\rightarrow}\Sigma F_x = 0: \quad \frac{1}{\sqrt{2}}F_{GH} - \frac{1}{\sqrt{2}}F_{EG} + \frac{1}{\sqrt{2}}(4.243\text{ kN}) = 0$$

or
$$F_{GH} - F_{EG} = -4.243\text{ kN} \qquad (1)$$

$$+\uparrow\Sigma F_y = 0: \quad -\frac{1}{\sqrt{2}}F_{GH} - \frac{1}{\sqrt{2}}F_{EG} - \frac{1}{\sqrt{2}}(4.243\text{ kN}) - 1.5\text{ kN} = 0$$

or
$$F_{GH} + F_{EG} = -6.364\text{ kN} \qquad (2)$$

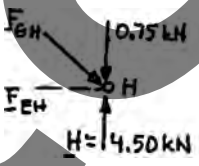
Add Eqs. (1) and (2): $2F_{GH} = -10.607$

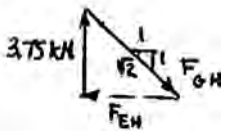
$$F_{GH} = -5.303 \qquad F_{GH} = 5.30\text{ kN} \quad C \blacktriangleleft$$

Subtract Eq. (1) from Eq. (2): $2F_{EG} = -2.121\text{ kN}$

$$F_{EG} = -1.0605\text{ kN} \qquad F_{EG} = 1.061\text{ kN} \quad C \blacktriangleleft$$

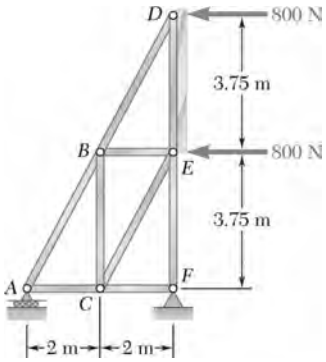
Free body: Joint *H*:





$$\frac{F_{EH}}{1} = \frac{3.75\text{ kN}}{1} \qquad F_{EH} = 3.75\text{ kN} \quad T \blacktriangleleft$$

We can also write
$$\frac{F_{GH}}{\sqrt{2}} = \frac{3.75\text{ kN}}{1} \qquad F_{GH} = 5.30\text{ kN} \quad C \quad \text{(Checks)}$$

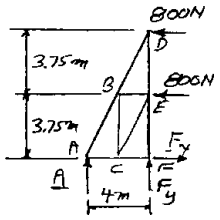


PROBLEM 6.14

The truss shown is one of several supporting an advertising panel. Determine the force in each member of the truss for a wind load equivalent to the two forces shown. State whether each member is in tension or compression.

SOLUTION

Free body: Entire truss:



$$+\circlearrowleft \Sigma M_F = 0: \quad (800\text{ N})(7.5\text{ m}) + (800\text{ N})(3.75\text{ m}) - A(2\text{ m}) = 0$$

$$A = +2250\text{ N} \qquad \mathbf{A} = 2250\text{ N}\uparrow$$

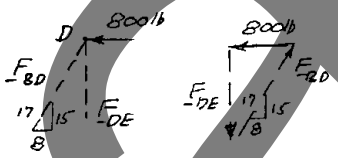
$$+\uparrow \Sigma F_y = 0: \quad 2250\text{ N} + F_y = 0$$

$$F_y = -2250\text{ N} \quad \mathbf{F}_y = 2250\text{ N}\downarrow$$

$$\pm \rightarrow \Sigma F_x = 0: \quad -800\text{ N} - 800\text{ N} + F_x = 0$$

$$F_x = +1600\text{ N} \quad \mathbf{F}_x = 1600\text{ N}\rightarrow$$

Joint *D*:

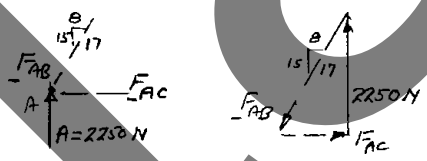


$$\frac{800\text{ N}}{8} = \frac{F_{DE}}{15} = \frac{F_{BD}}{17}$$

$$F_{BD} = 1700\text{ N} \quad C \blacktriangleleft$$

$$F_{DE} = 1500\text{ N} \quad T \blacktriangleleft$$

Joint *A*:

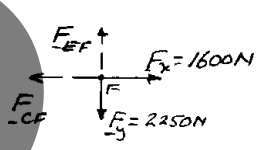


$$\frac{2250\text{ N}}{15} = \frac{F_{AB}}{17} = \frac{F_{AC}}{8}$$

$$F_{AB} = 2250\text{ N} \quad C \blacktriangleleft$$

$$F_{AC} = 1200\text{ N} \quad T \blacktriangleleft$$

Joint *F*:



$$\pm \rightarrow \Sigma F_x = 0: \quad 1600\text{ N} - F_{CF} = 0$$

$$F_{CF} = +1600\text{ N} \qquad F_{CF} = 1600\text{ N} \quad T \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad F_{EF} - 2250\text{ N} = 0$$

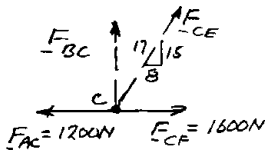
$$F_{EF} = +2250\text{ N} \qquad F_{EF} = 2250\text{ N} \quad T \blacktriangleleft$$

PROBLEM 6.14 (Continued)

Joint *C*:

$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad \frac{8}{17} F_{CE} - 1200 \text{ N} + 1600 \text{ N} = 0$$

$$F_{CE} = -850 \text{ N} \qquad F_{CE} = 850 \text{ N} \quad C \blacktriangleleft$$



$$+\uparrow \Sigma F_y = 0: \quad F_{BC} + \frac{15}{17} F_{CE} = 0$$

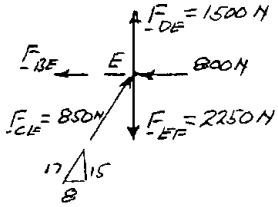
$$F_{BC} = -\frac{15}{17} F_{CE} = -\frac{15}{17}(-850 \text{ N})$$

$$F_{BC} = +750 \text{ N} \qquad F_{BC} = 750 \text{ N} \quad T \blacktriangleleft$$

Joint *E*:

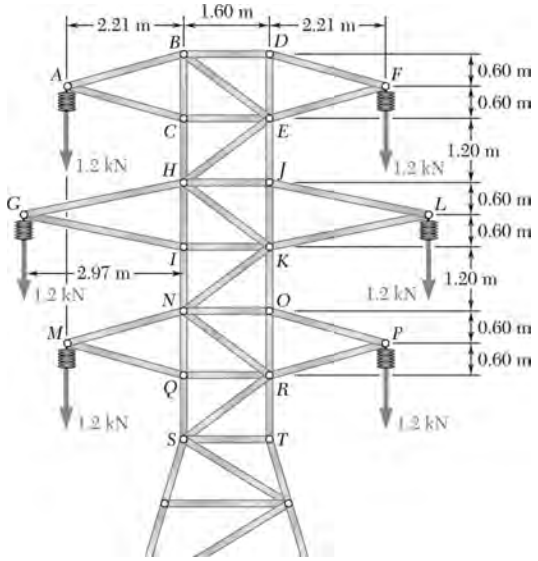
$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad -F_{BE} - 800 \text{ N} + \frac{8}{17}(850 \text{ N}) = 0$$

$$F_{BE} = -400 \text{ N} \qquad F_{BE} = 400 \text{ N} \quad C \blacktriangleleft$$



$$+\uparrow \Sigma F_y = 0: \quad 1500 \text{ N} - 2250 \text{ N} + \frac{15}{17}(850 \text{ N}) = 0$$

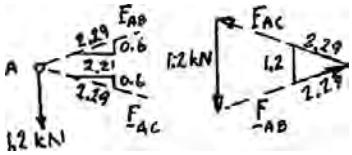
$$0 = 0 \quad \text{(checks)}$$



PROBLEM 6.23

The portion of truss shown represents the upper part of a power transmission line tower. For the given loading, determine the force in each of the members located above *HJ*. State whether each member is in tension or compression.

SOLUTION

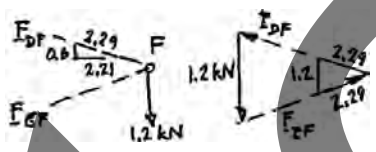


Free body: Joint *A*:

$$\frac{F_{AB}}{2.29} = \frac{F_{AC}}{2.29} = \frac{1.2\text{ kN}}{1.2}$$

$F_{AB} = 2.29\text{ kN} \quad T$ ◀

$F_{AC} = 2.29\text{ kN} \quad C$ ◀

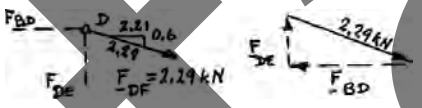


Free body: Joint *F*:

$$\frac{F_{DF}}{2.29} = \frac{F_{EF}}{2.29} = \frac{1.2\text{ kN}}{2.1}$$

$F_{DF} = 2.29\text{ kN} \quad T$ ◀

$F_{EF} = 2.29\text{ kN} \quad C$ ◀



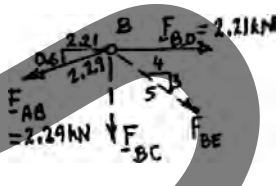
Free body: Joint *D*:

$$\frac{F_{BD}}{2.21} = \frac{F_{DE}}{0.6} = \frac{2.29\text{ kN}}{2.29}$$

$F_{BD} = 2.21\text{ kN} \quad T$ ◀

$F_{DE} = 0.600\text{ kN} \quad C$ ◀

Free body: Joint *B*:



$$\overset{+}{\rightarrow} \Sigma F_x = 0: \quad \frac{4}{5}F_{BE} + 2.21\text{ kN} - \frac{2.21}{2.29}(2.29\text{ kN}) = 0$$

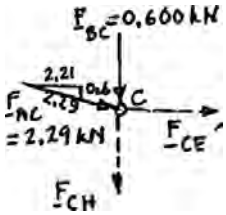
$F_{BE} = 0$ ◀

$$+\uparrow \Sigma F_y = 0: \quad -F_{BC} - \frac{3}{5}(0) - \frac{0.6}{2.29}(2.29\text{ kN}) = 0$$

$F_{BC} = -0.600\text{ kN}$ $\qquad F_{BC} = 0.600\text{ kN} \quad C$ ◀

PROBLEM 6.23 (Continued)

Free body: Joint *C*:



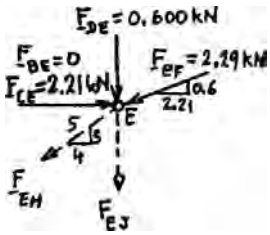
$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad F_{CE} + \frac{2.21}{2.29}(2.29\text{ kN}) = 0$$

$$F_{CE} = -2.21\text{ kN} \qquad F_{CE} = 2.21\text{ kN} \quad C \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad -F_{CH} - 0.600\text{ kN} - \frac{0.6}{2.29}(2.29\text{ kN}) = 0$$

$$F_{CH} = -1.200\text{ kN} \qquad F_{CH} = 1.200\text{ kN} \quad C \blacktriangleleft$$

Free body: Joint *E*:

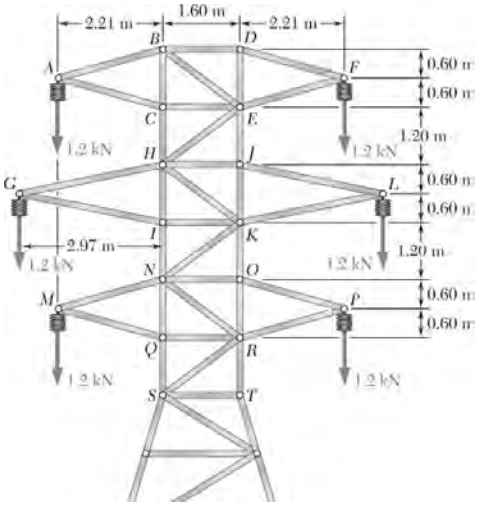


$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad 2.21\text{ kN} - \frac{2.21}{2.29}(2.29\text{ kN}) - \frac{4}{5}F_{EH} = 0$$

$$F_{EH} = 0 \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad -F_{EJ} - 0.600\text{ kN} - \frac{0.6}{2.29}(2.29\text{ kN}) - 0 = 0$$

$$F_{EJ} = -1.200\text{ kN} \qquad F_{EJ} = 1.200\text{ kN} \quad C \blacktriangleleft$$

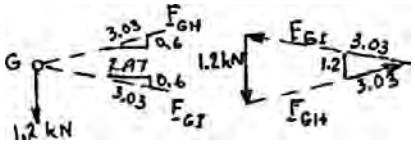


PROBLEM 6.24

For the tower and loading of Problem 6.23 and knowing that $F_{CH} = F_{EJ} = 1.2$ kN C and $F_{EH} = 0$, determine the force in member HJ and in each of the members located between HJ and NO. State whether each member is in tension or compression.

PROBLEM 6.23 The portion of truss shown represents the upper part of a power transmission line tower. For the given loading, determine the force in each of the members located above HJ. State whether each member is in tension or compression.

SOLUTION

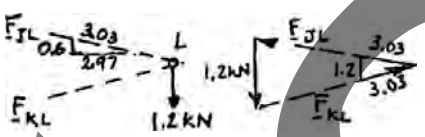


Free body: Joint G:

$$\frac{F_{GH}}{3.03} = \frac{F_{GI}}{3.03} = \frac{1.2\text{ kN}}{1.2}$$

$$F_{GH} = 3.03\text{ kN} \quad T \blacktriangleleft$$

$$F_{GI} = 3.03\text{ kN} \quad C \blacktriangleleft$$

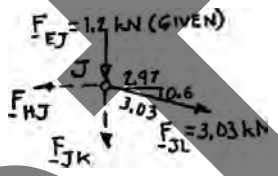


Free body: Joint L:

$$\frac{F_{JL}}{3.03} = \frac{F_{KL}}{3.03} = \frac{1.2\text{ kN}}{1.2}$$

$$F_{JL} = 3.03\text{ kN} \quad T \blacktriangleleft$$

$$F_{KL} = 3.03\text{ kN} \quad C \blacktriangleleft$$



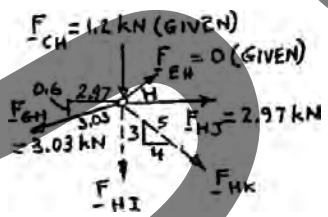
Free body: Joint J:

$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad -F_{HJ} + \frac{2.97}{3.03}(3.03\text{ kN}) = 0$$

$$F_{HJ} = 2.97\text{ kN} \quad T \blacktriangleleft$$

$$+\uparrow F_y = 0: \quad -F_{JK} - 1.2\text{ kN} - \frac{0.6}{3.03}(3.03\text{ kN}) = 0$$

$$F_{JK} = -1.800\text{ kN} \qquad F_{JK} = 1.800\text{ kN} \quad C \blacktriangleleft$$



Free body: Joint H:

$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad \frac{4}{5}F_{HK} + 2.97\text{ kN} - \frac{2.97}{3.03}(3.03\text{ kN}) = 0$$

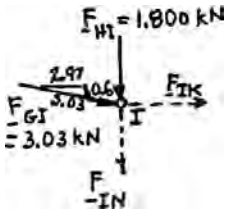
$$F_{HK} = 0 \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad -F_{HI} - 1.2\text{ kN} - \frac{0.6}{3.03}(3.03)\text{ kN} - \frac{3}{5}(0) = 0$$

$$F_{HI} = -1.800\text{ kN} \qquad F_{HI} = 1.800\text{ kN} \quad C \blacktriangleleft$$

PROBLEM 6.24 (Continued)

Free body: Joint *I*:



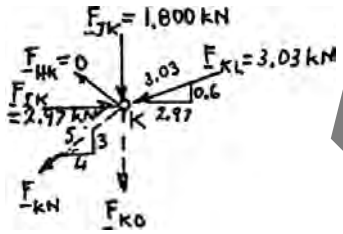
$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad F_{IK} + \frac{2.97}{3.03}(3.03\text{ kN}) = 0$$

$$F_{IK} = -2.97\text{ kN} \qquad F_{IK} = 2.97\text{ kN} \quad C \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad -F_{IN} - 1.800\text{ kN} - \frac{0.6}{3.03}(3.03\text{ kN}) = 0$$

$$F_{IN} = -2.40\text{ kN} \qquad F_{IN} = 2.40\text{ kN} \quad C \blacktriangleleft$$

Free body: Joint *K*:

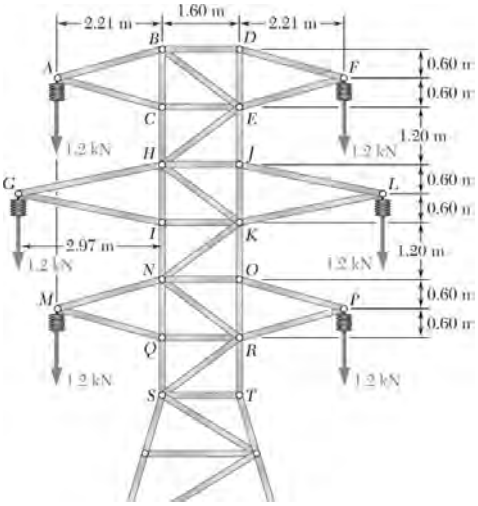


$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad -\frac{4}{5}F_{KN} + 2.97\text{ kN} - \frac{2.97}{3.03}(3.03\text{ kN}) = 0$$

$$F_{KN} = 0 \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad -F_{KO} - \frac{0.6}{3.03}(3.03\text{ kN}) - 1.800\text{ kN} - \frac{3}{5}(0) = 0$$

$$F_{KO} = -2.40\text{ kN} \qquad F_{KO} = 2.40\text{ kN} \quad C \blacktriangleleft$$

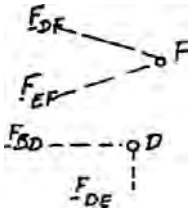


PROBLEM 6.25

Solve Problem 6.23 assuming that the cables hanging from the right side of the tower have fallen to the ground.

PROBLEM 6.23 The portion of truss shown represents the upper part of a power transmission line tower. For the given loading, determine the force in each of the members located above *HJ*. State whether each member is in tension or compression.

SOLUTION



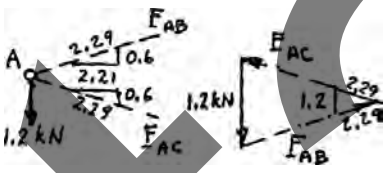
Zero-Force Members:

Considering joint *F*, we note that *DF* and *EF* are zero-force members:

$$F_{DF} = F_{EF} = 0 \blacktriangleleft$$

Considering next joint *D*, we note that *BD* and *DE* are zero-force members:

$$F_{BD} = F_{DE} = 0 \blacktriangleleft$$

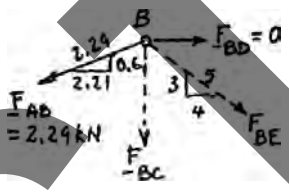


Free body: Joint *A*:

$$\frac{F_{AB}}{2.29} = \frac{F_{AC}}{2.29} = \frac{1.2 \text{ kN}}{1.2}$$

$$F_{AB} = 2.29 \text{ kN} \quad T \blacktriangleleft$$

$$F_{AC} = 2.29 \text{ kN} \quad C \blacktriangleleft$$



Free body: Joint *B*:

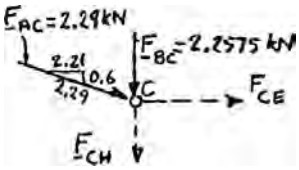
$$\overset{+}{\rightarrow} \Sigma F_x = 0: \quad \frac{4}{5} F_{BE} - \frac{2.21}{2.29}(2.29 \text{ kN}) = 0$$

$$F_{BE} = 2.7625 \text{ kN} \qquad F_{BE} = 2.76 \text{ kN} \quad T \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad -F_{BC} - \frac{0.6}{2.29}(2.29 \text{ kN}) - \frac{3}{5}(2.7625 \text{ kN}) = 0$$

$$F_{BC} = -2.2575 \text{ kN} \qquad F_{BC} = 2.26 \text{ kN} \quad C \blacktriangleleft$$

PROBLEM 6.25 (Continued)



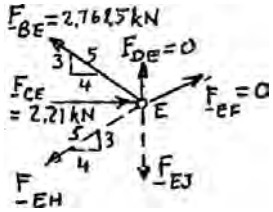
Free body: Joint *C*:

$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad F_{CE} + \frac{2.21}{2.29}(2.29\text{ kN}) = 0$$

$$F_{CE} = 2.21\text{ kN} \quad C \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad -F_{CH} - 2.2575\text{ kN} - \frac{0.6}{2.29}(2.29\text{ kN}) = 0$$

$$F_{CH} = -2.8575\text{ kN} \qquad F_{CH} = 2.86\text{ kN} \quad C \blacktriangleleft$$



Free body: Joint *E*:

$$\stackrel{+}{\rightarrow} \Sigma F_x = 0: \quad -\frac{4}{5}F_{EH} - \frac{4}{5}(2.7625\text{ kN}) + 2.21\text{ kN} = 0$$

$$F_{EH} = 0 \blacktriangleleft$$

$$+\uparrow \Sigma F_y = 0: \quad -F_{EJ} + \frac{3}{5}(2.7625\text{ kN}) - \frac{3}{5}(0) = 0$$

$$F_{EJ} = +1.6575\text{ kN} \qquad F_{EJ} = 1.658\text{ kN} \quad T \blacktriangleleft$$