7-5. Determine (approximately) the force in each member of the truss. Assume the diagonals can support both tensile and compressive forces.

Support Reactions

\[ \sum F_y = 0; \quad 8 + 10 - A_y = 0; \quad A_y = 18 \text{ kN} \]

\[ \sum M_b = 0; \quad (4) + 10(2) - 1.5(B_y) = 0; B_y = 34.67 \text{ kN} \]

\[ \sum F_x = 0; \quad A_x = 34.67 \text{ kN} \]

\[ V_{nets} = 8 \text{ kN} \]

\[ F_{EC} = \frac{5}{3}(4) = 6.67 \text{ kN (C)} \quad \text{Ans} \]

\[ F_{DF} = \frac{5}{3}(4) = 6.67 \text{ kN (T)} \quad \text{Ans} \]

\[ \xi \sum M_D = 0; \quad F_{DE}(1.5) - 6.67(\frac{4}{3})(1.5) = 0 \]

\[ F_{DC} = 5.33 \text{ kN (C)} \quad \text{Ans} \]

\[ \zeta \sum M_D = 0; \quad F_{DF}(1.5) - 6.67(\frac{3}{5})(1.5) = 0 \]

\[ F_{EF} = 5.33 \text{ kN (T)} \quad \text{Ans} \]

Joint D

\[ \sum F_y = 0; \quad F_{BE} - 6.67(\frac{3}{5}) = 0; \quad F_{DE} = 4.0 \text{ kN (C)} \quad \text{Ans} \]

\[ V_{nets} = 18 \text{ kN} \]

\[ F_{AC} = \frac{5}{3}(9) = 15.0 \text{ kN (T)} \quad \text{Ans} \]

\[ F_{AF} = \frac{5}{3}(9) = 15.0 \text{ kN (C)} \quad \text{Ans} \]

\[ \xi \sum M_A = 0; \quad 34.67(1.5) - F_{CD}(1.5) - 15.0(\frac{4}{3})(1.5) = 0 \]

\[ F_{CD} = 22.7 \text{ kN (C)} \quad \text{Ans} \]

\[ \zeta \sum M_A = 0; \quad 34.67(1.5) - F_{DF}(1.5) - 15.0(\frac{3}{5})(1.5) = 0 \]

\[ F_{AF} = 22.7 \text{ kN (T)} \quad \text{Ans} \]

Joint B

\[ \sum F_y = 0; \quad -F_{AB} + 15(\frac{3}{5}) = 0; \quad F_{AB} = 9.0 \text{ kN (T)} \quad \text{Ans} \]

Joint C

\[ \sum F_y = 0; \quad 6.67(\frac{3}{5}) - 15(\frac{3}{5}) + F_{CF} = 0; \quad F_{CF} = 5 \text{ kN (C)} \quad \text{Ans} \]
7.2. Determine (approximately) the force in each member of the truss. Assume the diagonals cannot support a compressive force.

Assume: $F_{EA} = 0$  Ans

\[ +TF_1 = 0: \quad F_{EA}(\sin 45^\circ) - 4 + 11 = 0 \]

\[ F_{EA} = 9.899 \text{ kN} \quad (T) \quad \text{Ans} \]

\[ -TF_2 = 0: \quad F_{EA} = 9.90 \text{ kN} (T) \quad \text{Ans} \]

\[ +TF_3 = 0: \quad F_{EA}(\sin 45^\circ) - 8 - 4 = 0 \]

\[ F_{EA} = 1.414 \text{ kN} (T) \quad \text{Ans} \]

\[ -TF_4 = 0: \quad F_{EA}(\sin 45^\circ) - 10 - 0 = 0 \]

\[ F_{EA} = 9.00 \text{ kN} (T) \quad \text{Ans} \]
7-16. Determine (approximately) the support actions at A, B, and C of the frame.

\[
\begin{align*}
A_x = 0 & \quad B_x = 0 & \quad C_x = 0 & \quad A_{mx} = 0 \\
A_y = 12 \text{ k} & \quad B_y = 16 \text{ k} & \quad C_y = 4 \text{ k} & \quad A_{my} = 0 \\
M_x = 16.2 \text{ k ft} & \quad M_y = 9 \text{ k ft} & \quad M_z = 7.2 \text{ k ft} & \quad A_{mz} = 0
\end{align*}
\]
7-17. Determine (approximately) the force in each truss member of the portal frame. Also compute the reactions at the fixed column supports A and B. Assume all members of the truss to be pin-connected at their ends.

7-18. Draw (approximately) the moment diagram for column ACE of the portal. Assume that all points of connection are pins. Also determine the force in the truss members EG, CG, and CD.