A simple struss supports a force F that acts on joint B. Identify the zero-force members in the simple truss and the internal forces in each member.

Select the zero-force members.

BD

BF

Determine the internal forces in each member. Denote compressive forces as (-) and tensile forces as (+).

$\Sigma B_y = 0 \rightarrow F_{BE} - F = 0 \rightarrow F_{BE} = F$ (Tensile)

$\Sigma E_x = 0 \rightarrow F_{DE} \cos(\theta_1) - F_{EF} \cos(\theta_1) = 0 \rightarrow F_{EF} = F_{DE}$ (Both compressive or both tensile)

$\Sigma E_y = 0 \rightarrow -F_{BE} - F_{EF} \sin(\theta_1) - F_{DE} \sin(\theta_1) = 0 \rightarrow F_{EF} = F_{DE} = -\dfrac{F}{2 \sin(\theta_1)}$ (Compressive)

$\Sigma F = 0 \& \Sigma D = 0 \rightarrow F_{AF} = F_{CD} = F_{DE} = F_{EF}$ (Compressive)

$\Sigma B_x = 0 \rightarrow F_{BC} - F_{AB} = 0 \rightarrow F_{AB} = F_{BC}$

$\Sigma A_x = 0 \rightarrow F_{AB} + F_{AF} \cos(\theta_1) = 0 \rightarrow F_{AB} = F_{BC} = \dfrac{F}{2 \tan(\theta_1)}$ (Tensile)

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