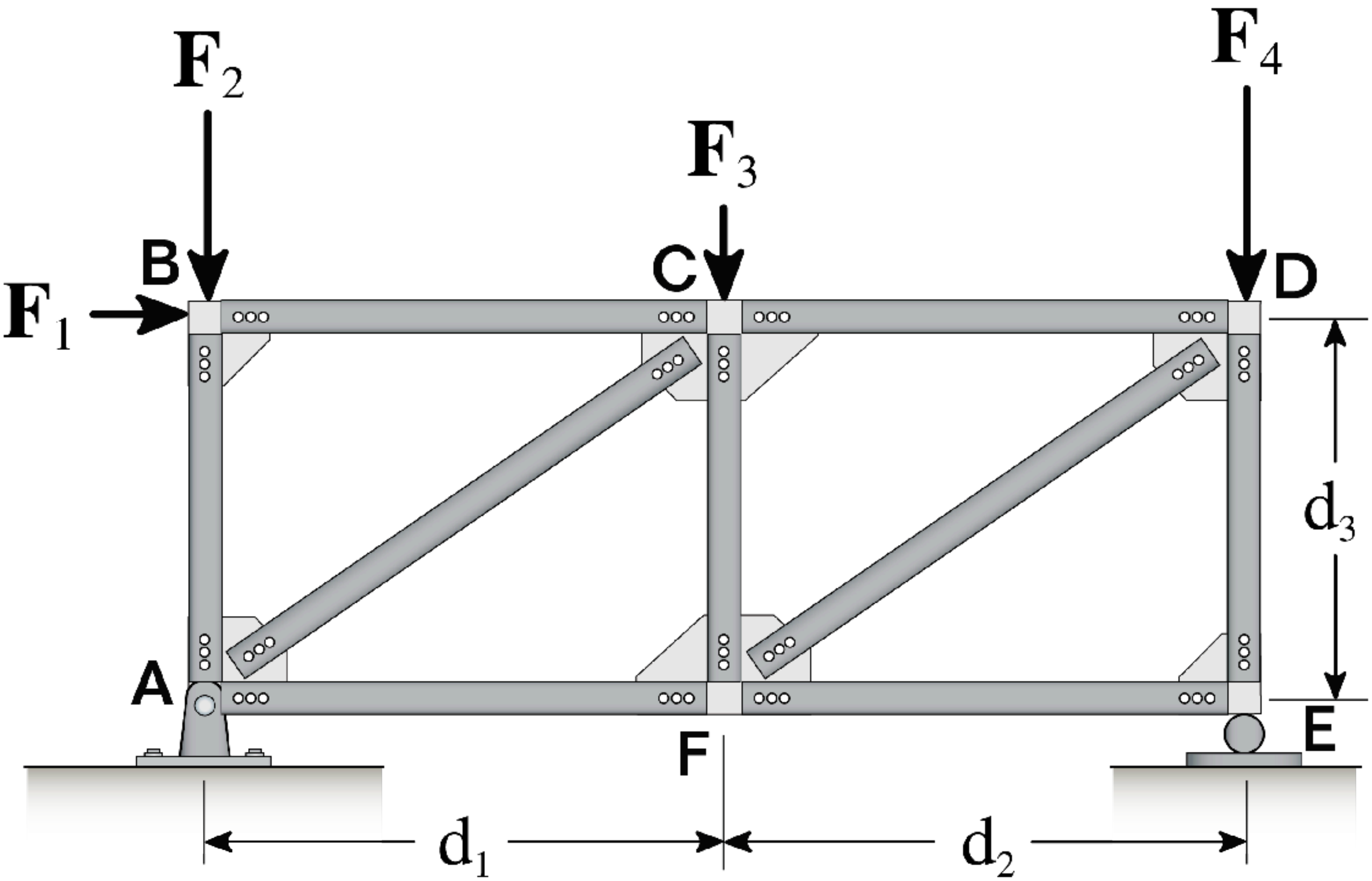

A rectangular shaped truss supports loads F_1, F_2, F_3, and F_4 as shown above. If the truss is supported by a pin at A and a roller at B, find the internal forces in each member. Assume that all joints are pin connected.

Find the reaction forces at point A and point E.

$$+\rightarrow \Sigma F_x = 0 \rightarrow A_x + F_1 = 0 \rightarrow A_x = -F_1$$

$$\Sigma M_A = 0 \rightarrow (d_1 + d_2) \cdot (E_y - F_4) - d_1 \cdot F_3 - d_3 \cdot F_1 = 0 \rightarrow E_y = F_4 + \frac{d_1 \cdot F_3 + d_3 \cdot F_1}{d_1 + d_2}$$

$$+\uparrow \Sigma F_y = 0 \rightarrow A_y + E_y - F_2 - F_3 - F_4 = 0 \rightarrow A_y = F_2 + F_3 + F_4 - E_y$$

Find the internal forces in each member. Determine if the force is tensile, compressive, or zero.

Assume that tensile forces are positive.

$$+\rightarrow \Sigma B_x = 0 \rightarrow F_{BC} + F_1 = 0 \rightarrow F_{BC} = -F_1$$

$$+\uparrow \Sigma B_y = 0 \rightarrow -F_{AB} - F_2 = 0 \rightarrow F_{AB} = -F_2$$

$$+\uparrow \Sigma A_y = 0 \rightarrow A_y + F_{AB} + \frac{d_3}{\sqrt{{d_1}^2 + {d_3}^2}} F_{AC} = 0 \rightarrow F_{AC} = -\frac{\sqrt{{d_1}^2 + {d_3}^2}}{d_3} \cdot (A_y - F_2)$$

$$+\rightarrow \Sigma A_x = 0 \rightarrow A_x + F_{AF} + \frac{d_1}{\sqrt{{d_1}^2 + {d_3}^2}} F_{AC} = 0 \rightarrow F_{AF} = F_1 - \frac{d_1}{\sqrt{{d_1}^2 + {d_3}^2}} F_{AC} \rightarrow F_{AF} = F_1 + \frac{d_1}{d_3}(A_y - F_2)$$

$$+\uparrow \Sigma C_y = 0 \rightarrow -F_3 - F_{CF} - \frac{d_3}{\sqrt{{d_1}^2 + {d_3}^2}} F_{AC} = 0 \rightarrow F_{CF} = A_y - F_2 - F_3 = F_4 - E_y$$

$$+\rightarrow \Sigma C_x = 0 \rightarrow F_{CD} - \frac{d_1}{\sqrt{{d_1}^2 + {d_3}^2}} F_{AC} = 0 \rightarrow F_{CD} = \frac{d_1}{d_3}(A_y - F_2)$$

$+\rightarrow \Sigma E_x = 0 \rightarrow -F_{EF} = 0 \rightarrow F_{EF} = 0$ (Zero-force member)

$$+\uparrow \Sigma E_y = 0 \rightarrow E_y + F_{DE} = 0 \rightarrow F_{DE} = -E_y$$

$$+\uparrow \Sigma D_y = 0 \rightarrow -F_4 - F_{DE} - \frac{d_3}{\sqrt{{d_2}^2 + {d_3}^2}} F_{DF} = 0 \rightarrow F_{DF} = \frac{\sqrt{{d_2}^2 + {d_3}^2}}{d_3} \cdot (E_y - F_4)$$