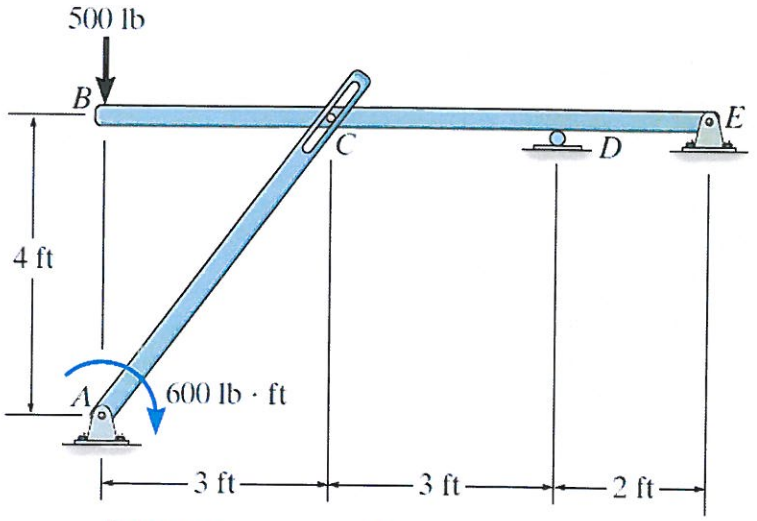
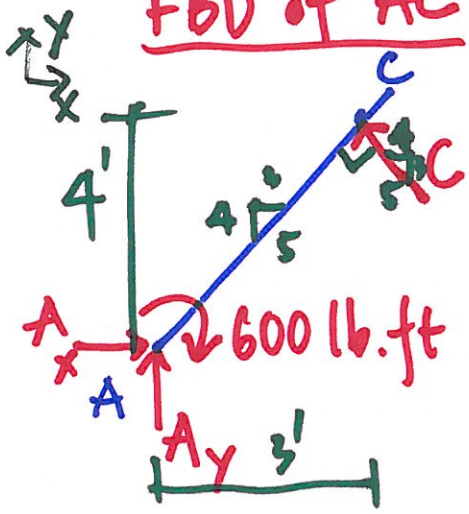
6-77

The two-member structure is connected at C by a pin, which is fixed to BDE and passes through the smooth slot in member AC. Determine the horizontal and vertical components of reaction at the supports.



FBD of AC



$\circlearrowleft \Sigma M_A = 0 = C(5) - 600$

$C = 120\ \text{lb}$

$\rightarrow \Sigma F_x = 0 = A_x - C\left(\frac{4}{5}\right)$ (C = 120 lb)

$A_x = 96\ \text{lb} \leftarrow$ Ans.

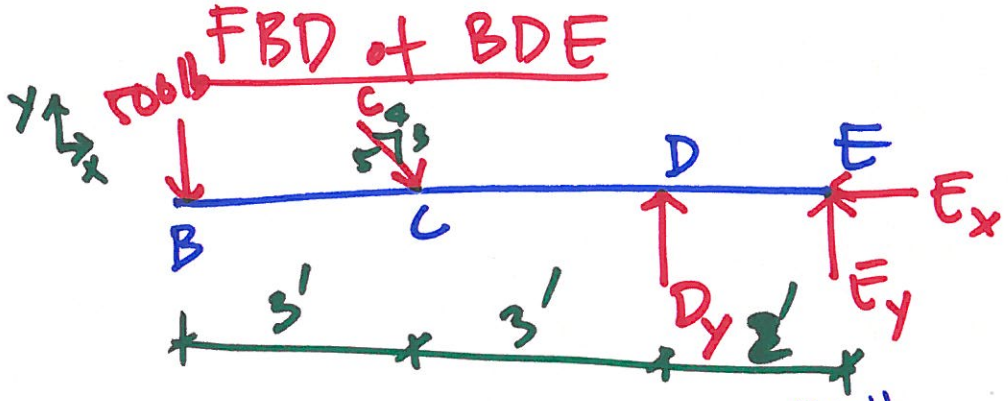
$+\uparrow \Sigma F_y = 0 = A_y + C\left(\frac{3}{5}\right)$

$A_y = -72$

$A_y = 72\ \text{lb} \downarrow$

Ans.

FBD of BDE



$\circlearrowleft \Sigma M_E = 0 = 500(8) + \frac{3}{5}(C)(5) - D_y(2)$ (C = 120 lb)

$D_y = 2180\ \text{lb}$

$D_y = 2.18\ \text{kips} \uparrow$

Ans.

$+\rightarrow \Sigma F_x = 0 = \left(\frac{4}{5}\right)C - E_x$ (C = 120 lb)

$E_x = 96\ \text{lb} \leftarrow$

Ans.

$+\uparrow \Sigma F_y = 0 = -500 - \left(\frac{3}{5}\right)(C) + D_y + E_y$ (C = 120 lb, D_y = 2180 lb)

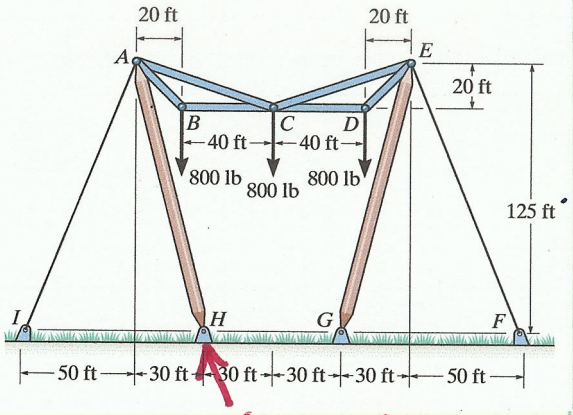
$E_y = -1608$

$E_y = 1.608\ \text{kips} \downarrow$

Ans.

6-85

The three power lines exert the forces shown on the truss joints, which in turn are pin-connected to the poles AH and EG. Determine the force in the guy cable AI and the pin reaction at the support H.

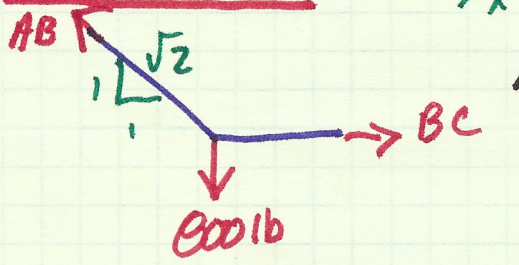


SOLUTION

AH IS 2-FORCE MEMBER

AH = 3.99 K

FBD JOINT B

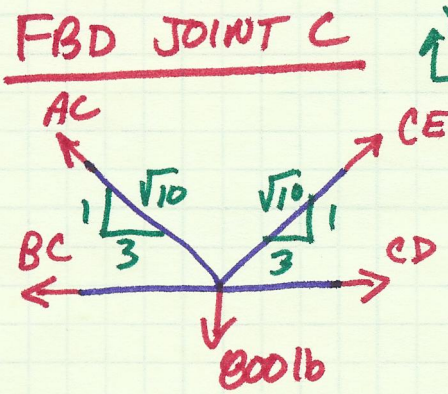


$\uparrow \Sigma F_y = 0$

$-800 + \frac{1}{\sqrt{2}} AB = 0$ $\quad AB = 1131 \text{ lbs (T)}$

FBD JOINT C

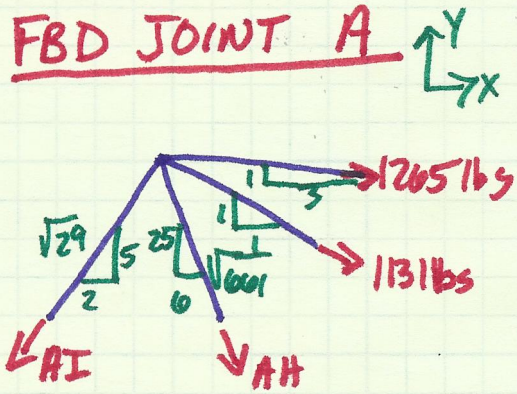
CE = AC (SYMMETRY)



$\uparrow \Sigma F_y = 0$

$2AC\left(\frac{1}{\sqrt{10}}\right) - 800 = 0$ $\quad A = 1265 \text{ lbs (T)}$

FBD JOINT A



$\rightarrow \Sigma F_x = 0$

$-\frac{2}{\sqrt{29}} AI + \frac{6}{\sqrt{1001}} AH + \frac{1}{\sqrt{2}}(1131) + \frac{3}{\sqrt{10}}(1265) = 0$

$-.371\,AI + .233\,AH = -2000$ (1)

$\uparrow \Sigma F_y = 0$

$-\frac{5}{\sqrt{29}} AI - \frac{25}{\sqrt{1001}} AH - \frac{1}{\sqrt{2}}(1131) - \frac{1}{\sqrt{10}}(1265) = 0$

$-.9285\,AI - .972\,AH = 1200$ (2)

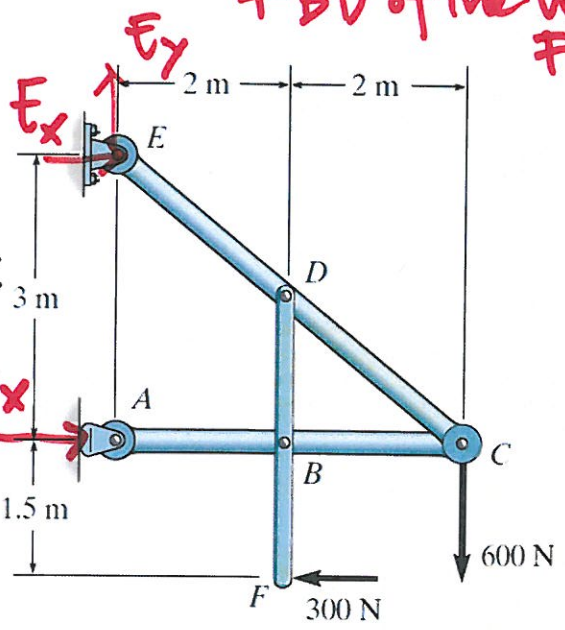
SOLVE (1)+(2)

$AI = 2.88 \text{ Kips (T)}$

$AH = -3.99 = 3.99 \text{ Kips (C)}$

6-89

Determine the horizontal and vertical components of force which pin *C* exerts on member *CDE*. The 600-N load is applied to the pin.



FBD of the Whole Frame:

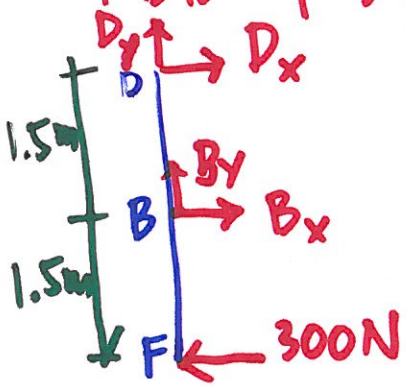
From FBD of the whole Frame:

$\circlearrowleft \Sigma M_E = 0 = A_x(3) - 300(4.5) - 600(4)$

$A_x = 1250\ N \rightarrow$

(May find E_x & E_y but the question doesn't ask for)

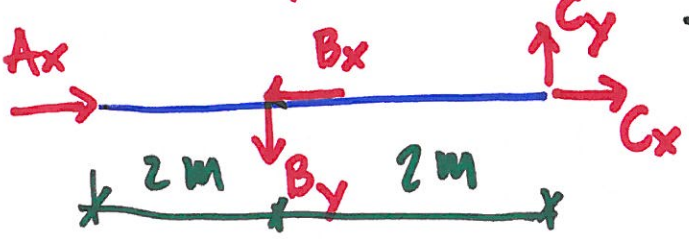
FBD of DBF:



$\circlearrowleft \Sigma M_D = 0 = B_x(1.5) - 300(3)$

$B_x = 600\ N \rightarrow$ on DBF

FBD of ABC:



$\rightarrow \Sigma F_x = 0 = A_x - B_x + C_x$ (1250 →, 600 →)

$C_x = -650$

$C_x = 650\ N \leftarrow$ on ABC

or $C_x = 650\ N \rightarrow$ on CDE

Ans.

$\circlearrowleft \Sigma M_B = 0 = C_y(2)$

$C_y = 0$

Ans.