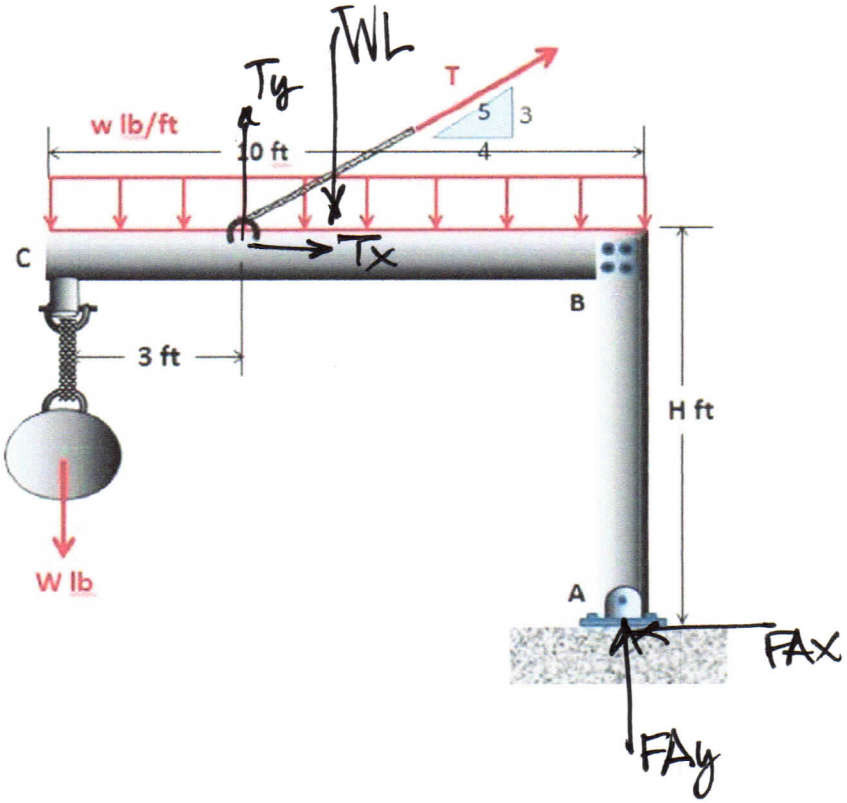
SOLUTION

ip4STATICS Worksheet for U04_P13

The structure shown below is in equilibrium with pole AB in the vertical position. Tension T in the cable is required to maintain equilibrium. Note that the pole can pivot at its base.

Instance variables: force W lb, load w lb/ft, length H ft.



Set up

$T_x = T*(\frac{4}{5})$

$T_y = T\cdot(\frac{3}{5})$

$WL = 10.w$

(1) What is force T required for equilibrium?

(2) What is the reaction force FA at A? ('mag,deg')

$\Sigma F_x = 0: \quad T_x = F_{Ax}$

$\Sigma F_y = 0: \quad T_y + F_{Ay} = W + WL$

$\Sigma M_A = 0: \quad 10.W + 5.WL - H.T_x - 7.T_y = 0$

(1) $10.W + 5.WL = H.T(\frac{4}{5}) + 7(\frac{3}{5})T$

so $|T| = \dfrac{25(2W + WL)}{(4H+21)}$; $\angle T$ as shown in figure.

(2) $FAx = \left(\frac{4}{5}\right)T.$

$FAy = W + WL - \left(\frac{3}{5}\right)T$

$|FA| = \sqrt{FAx^2 + FAy^2}$

$\angle FA = \tan^{-1}\left(FAy/FAx\right)$

Note. Since $FAy > 0$ and $FAx < 0$,
$\angle FA$ is neg (in quadrant IV).