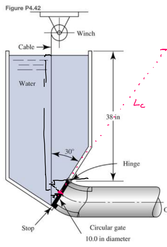
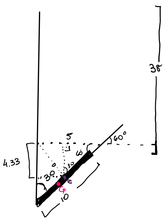
Hw 1.3.2

segunda-feira, 30 de setembro de 2024

4.42





$\sin 30° = \frac{w}{10} \rightarrow \sin 30° \times 10 = w$

$w = 5$ in

$\cos 30° = \frac{h}{5}$

$h = 5 \cos 30°$

$h = 4.33$ in

$h_c = h + 38 = 4.33 + 38$

$h_c = 42.33$ in $= 3.53$ ft

$A = \frac{\pi}{4} D^2 = \frac{10^2 \pi}{4} = 78.54$ in^2 $= 0.54$ ft^2

$I_c = \frac{\pi}{32} D^4 = \frac{\pi}{32} \cdot 10^4 = 981.75$ in^4 $= 0.0473$ ft^4

$F_R = \gamma h_c A$ $\quad \gamma_w = 62.4$ lb/ft^3

$F_R = 62.4 \times 3.53 \times 0.54$

$F_R = 118.95$ lb

$\cos 30° = \frac{h_c}{L_c} \rightarrow L_c \cos 30° = h_c$

$L_c = \frac{h_c}{\cos 30°} = \frac{3.53 \text{ ft}}{\cos 30°} \rightarrow L_c = 4.08$ ft

$L_p = \frac{I_c}{L_c A} + L_c \qquad L_p = \frac{0.0473 \text{ ft}^4}{4.08 \text{ ft} \times 0.54 \text{ ft}^2} + 4.08$ ft

$L_p = 4.10$ ft

$h_p = h_c + \frac{I_c \sin^2 \theta}{h_c A} = 3.53 \text{ ft} + \frac{0.0473 \text{ ft}^4 \cdot \sin^2 30°}{3.53 \text{ ft} \cdot 0.54 \text{ ft}^2} = 3.54$ ft

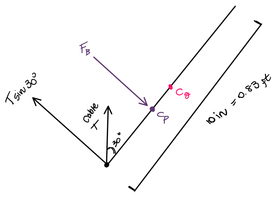
distance c_p from hinge

$= 3.54$ ft $- 38$ in

$\hookrightarrow 3.17$

$= 3.54 - 3.17 = 0.37$ ft or 4.44 in

FBD:



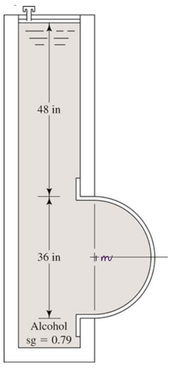
$\sum M = 0$

$T \sin 30° \times 0.83 \text{ ft} - F_R \times (L_p - 38 \text{ in}) = 0$

$T \sin 30° \times 0.83 \text{ ft} - 118.93 \times (4.1 \text{ ft} - 3.17) = 0$

$T = 266.52$ lb

4.54



$F_V = 9.81 \left[(2.13) \cdot 0.91 - \frac{\pi \times 0.91^2}{2} \right] \times 0.91$

$F_V = 5.69$ KN

$A x_V = A_{rec} \times x_{rec} - \frac{A}{2}_{cir} \times \frac{x}{2}_{cir}$

$x_v = \frac{\left[(2.13) \times 0.91 \right] \times \frac{0.91}{2} - \frac{\pi \cdot 0.91^2}{2} \times (0.38 \times 0.91)}{(2.13 \times 0.91) \times 0.91 - \frac{\pi \cdot 0.91}{2}}$

$x_v = 0.1148$ m

$F_h = 9.81 \left(1.2 + \frac{0.91}{2} \right) \cdot (0.91 \times 0.91)$

$F_h = 13.44$ KN

$L_p = L_c + \frac{I_c}{L_c A} \qquad L_c = 1.2 + \frac{0.91}{2} = 1.66$

$= 1.66 + \frac{\frac{0.91^3}{12}}{1.66 \cdot 1.82} = 16.25$ m

$F_R = \sqrt{F_V^2 + F_h^2} = \sqrt{5.69^2 + 16.25^2} = 17.21$ KN

$\tan \theta = \frac{F_V}{F_h} \rightarrow \tan^{-1} \left(\frac{5.69}{16.25} \right) = 19°$