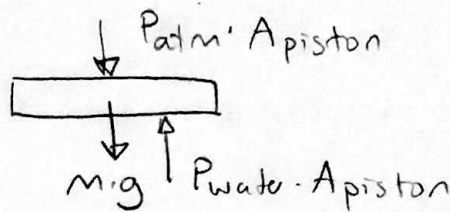


ÇANKAYA UNIVERSITY  
DEPARTMENT OF MECHANICAL ENGINEERING  
ME211 THERMODYNAMICS I

Quiz #1- 18.10.2017

Solution

A vertical piston/cylinder with a 0.3 m diameter piston of mass of 120 kg rests on the stops as shown in the figure. If the ambient pressure is 1 bar, what should be the pressure of water inside the cylinder to start lifting the piston?



$$A_{\text{piston}} = \frac{\pi \cdot d^2}{4}$$

$$A_{\text{piston}} = \underline{\underline{0,0707 \text{ m}^2}}$$

$$\sum F = 0 \Rightarrow P_{\text{atm}} \cdot A_{\text{piston}} + m \cdot g = P_{\text{water}} \cdot A_{\text{piston}}$$

$$\Rightarrow 1,01 \cdot 10^5 \cdot 0,0707 + 120 \cdot 9,81 = P_{\text{water}} \cdot 0,0707$$

$$\Rightarrow P_{\text{water}} = \underline{\underline{116,651 \text{ Pa} = 116,7 \text{ kPa}}}$$