

15/20 + 2.5

Mech322

Quiz 1

Name: Bryan Tilt

SR 10/14/03

1. Determine the angle of the ramp if a 40 lb, 0.8 ft diameter, 1 ft tall cylindrical tank slides down the ramp with a constant speed of 0.1 ft/s. A 0.002 ft thick oil layer of viscosity 0.2 lb s/ft<sup>2</sup> lubricates the ramp. 10

$$\mu = 0.2 \frac{\text{lb s}}{\text{ft}^2}$$

$$A = \pi R^2 = \pi (0.4)^2 = .5026 \text{ ft}^2$$

$$V = 0.1 \frac{\text{ft}}{\text{s}}$$

$$W = 40 \text{ lb}$$

$$R = .4 \text{ ft}$$

$$\tau A = F$$

$$U = \frac{\tau h}{\mu} =$$

$$\tau = \frac{U \mu}{h} = \frac{(0.1 \frac{\text{ft}}{\text{s}})(0.2 \frac{\text{lb s}}{\text{ft}^2})}{(0.002 \text{ ft})} = 10 \frac{\text{lb}}{\text{ft}^2}$$

$$F = (10 \frac{\text{lb}}{\text{ft}^2})(.5026 \text{ ft}^2) = 5.026 \text{ lbs}$$

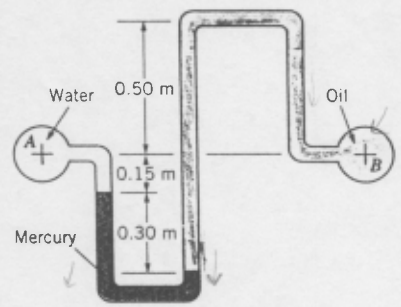


$$W \sin \theta = 5.026$$

$$\theta = \sin^{-1} \frac{5.026}{40}$$

$$\theta = 7.22^\circ$$

2. The mercury manometer indicates a differential reading of 0.30m when the pressure in A is 30 mm Hg vacuum. Find the pressure in pipe B. Note that SG<sub>oil</sub>=0.8 and SG<sub>Hg</sub>=13.6. Hint static pressure P=ρgh, for a fluid of density ρ. 10



$$P_{abs} - P_{atm} = P_{gauge}$$

$$P_B = \rho_2 g h_2 - \rho_1 g h_1$$

$$= (13600)(9.8)(0.3) - (800)(9.8)(0.15)$$

$$\rho_{H_2O} = 1000 \frac{\text{kg}}{\text{m}^3}$$

$$\rho_{oil} = \rho_{H_2O} (SG_{oil}) = 800 \frac{\text{kg}}{\text{m}^3}$$

$$\rho_{Hg} = (1000 \frac{\text{kg}}{\text{m}^3})(13.6) = 13600 \frac{\text{kg}}{\text{m}^3}$$

$$P_B = 36,456 \frac{\text{kg}}{\text{m}^2}$$

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$$P_{atm} - P_{abs} = P_{vac}$$

$$P_{abs} = P_{atm} - P_{vac} \quad P_{vac} = (13600)(9.8)(0.03) = 3998.4 \frac{\text{kg}}{\text{m}^2}$$

$$= 36,456 - 3998.4$$

$$P_{abs} = 32,457.6 \frac{\text{kg}}{\text{m}^2}$$

Bryan Telli

Quiz 1 Redo

10-31-03

$$2. \quad P_B = P_A + P_{Hg} + P_{H_2O} - P_{o.1} \quad P_A = -13,600(0.3)(9.81) = -4002.48$$

$$P_{o.1} = 800 \cdot 9.81 \cdot 0.45 = -3531.6$$

$$P_{Hg} = 13,600(9.81)(0.3) = 40,024.8$$

$$P_{H_2O} = 1000(9.81)(0.15) = 1471.5$$

$$P_B = 33,962 \text{ Pa}$$

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