College of Engineering & Technology

Department: Mechanical Engineering Marks: 20
Lecturer: Dr. Rola Afify Time: 11:30 – 12:10
Course Code: ME361 Date: 9/7/2015

Name: Model Answer R. N.:

Answer the following questions:

Question one (5 marks)

A) If a certain liquid has a specific weight of 8600 N/m^3, what are the values of its density, specific volume, and specific gravity?

Q1
A)

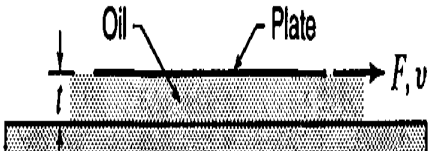
$w = 8600\ N/m^3 = \rho g$

$\therefore$ density $\rho = \frac{8600}{9.8} = 877.55\ Kg/m^3$

$\therefore$ Sp. volume $v = \frac{1}{\rho} = 1.14 * 10^{-3}\ m^3/Kg$

$\therefore$ Sp. gravity $\gamma = \frac{\rho_f}{\rho_w} = \frac{877.55}{1000} = 0.88$

B) A flat plate 200 mm x 750 mm slides on oil (μ = 0.85 Ns/m^2) over a large plane surface. What force (F) is required to drag the plate at a velocity (v) of 1.2 m/s, if the thickness (t) of the separating oil film is 0.6 mm?



B) $A = 200 * 750 * 10^{-6} = 0.15\ m^2$

$\mu = 0.85\ N.s/m^2$

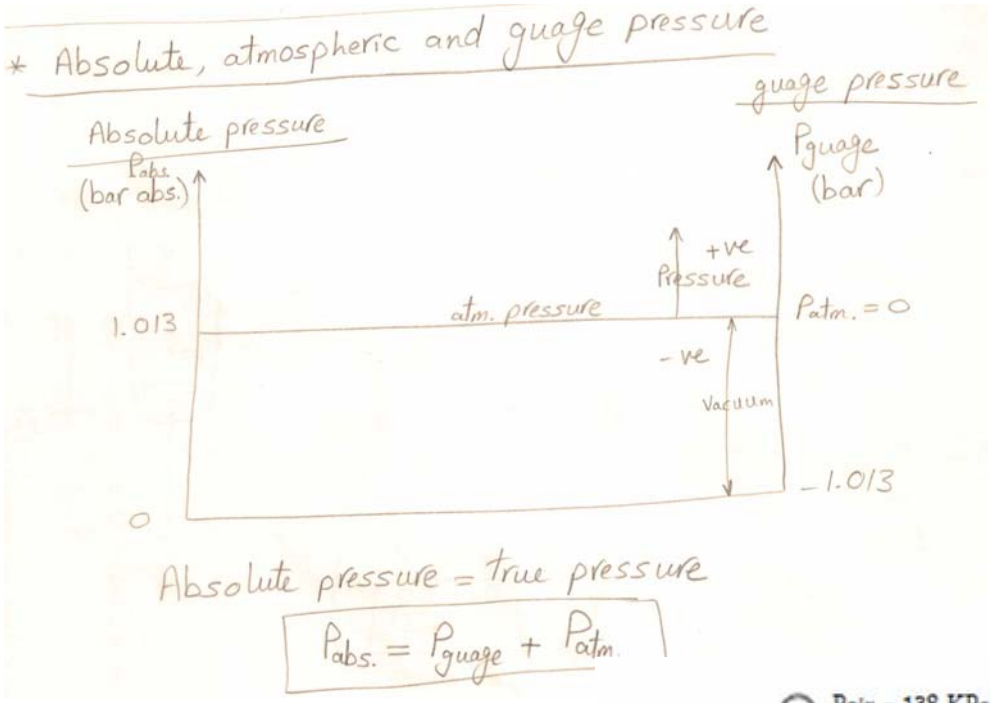
$V = 1.2\ m/s$ $dy = t = 0.6 * 10^{-3}\ m$

$F = \mu A \frac{du}{dy}$

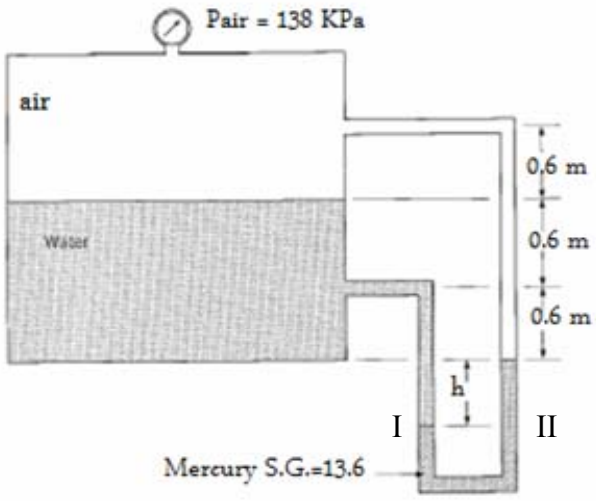
$= 0.85 * 0.15 * \frac{1.2}{0.6 * 10^{-3}} = 255\ Newton$

Question two (10 marks)

A) State the relation between absolute, atmospheric and gage pressure.



B) A U-tube mercury manometer is connected to a closed pressurized tank, as shown in figure. If the air pressure is 138 KPa, determine the differential reading, h. The specific weight of the air is negligible.



$$P_I = P_{II}$$

$$P_{air} + \rho_w g(0.6+0.6+h) = P_{air} + \rho_m g h$$

$$\rho_w g (0.6+0.6) = \rho_m g h - \rho_w g h$$

$$1000 * 9.8 * 1.2 = (13600 - 1000) * 9.8 * h$$

$$h = \frac{1000 * 1.2}{12600}$$

$$= \frac{2}{21} = 0.095 \text{ m}$$