1151241
Dr. Ahmad KoK
(10-11)

74/100

جامعة بيرزيت
BIRZEIT UNIVERSITY
Faculty of Engineering
Department of Mechanical Engineering

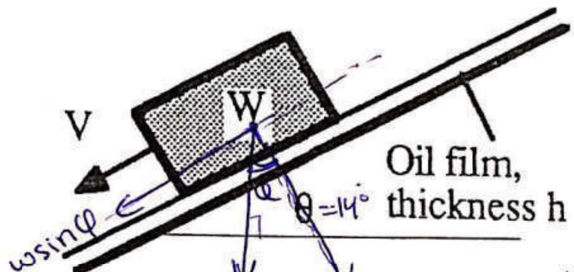
Fluid First Exam
Dr. Sameh Abu Awad

October 31st .2017 .

Problem 1(20 Points): ABET SO (a)

16/20

A solid aluminum disk (SG = 2.7) is 2 inches in diameter and 3/16 inch thick. It slides steadily down a 14° incline that is coated with a castor oil (SG = 0.96) film one hundredth of an inch thick. The steady slide velocity is 2 cm/s. Using Figure 1 and a linear oil velocity profile assumption, calculate the viscosity of the oil.



shear stress $\tau = \mu \frac{V}{h}$

$D = 2\text{ inches} = 5.08\text{ cm}$

$\text{depth} = 0.47625\text{ cm} \approx 0.48$

1 - 2.54
SG = 13.6

$W = \rho g V$

$= (2700)(9.8)\frac{\pi}{4}(0.0508)^2(4.8\times10^{-3})$

$W = 0.257\,N$

8

thickness of oil film = 2.45×10^{-4} m

$\tau A = W\sin\theta$

$\frac{2\text{ cm}}{s}\cdot\frac{1\text{ m}}{100\text{ cm}}$ = 0.02 m/s

$\tau = \frac{\text{Force}}{\text{Area}} = w\cos\varphi = \frac{0.257(\cos 14)}{\frac{\pi}{4}(0.0508)} = 6.25$

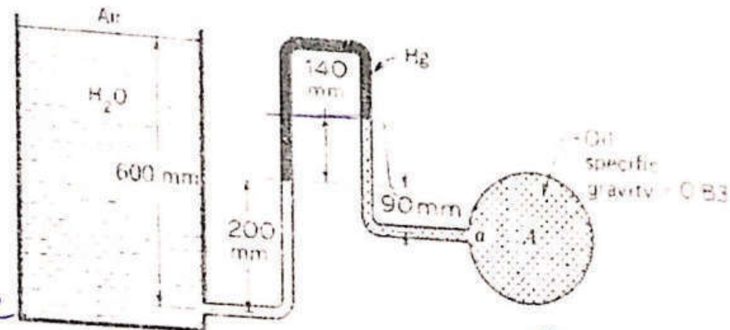
-4

$6.25 = \frac{\mu(0.02)}{2.45\times10^{-4}}$

$0.076 = \mu$ Kg/m.s

ɔblem 2(20 Points): ABET SO (a)

ɔr the setup shown in the figure below, calculate the absolute pressure at a. assume standard atmospheric pressure 101.3 kPa.



pressure increase

pressure decrease

18

$$P_{att} + \Sigma \rho g h = P_A$$

$$P_{atm} + (0.6)(1000)(9.8) - (0.2)(1000)(9.8) - (0.14)(13600)(9.8) + (0.23)(830)(9.8) = P_A$$

$$101300 + 5800 - 1960 - 18659.2 + 1870.82 = P_A$$

$$P_A = 88351.62 \text{ Pa}$$

2

Vacume

$$P_{absolute} = P_{atm} - P_{vacume}$$

$$= 101300 - 88351.62$$

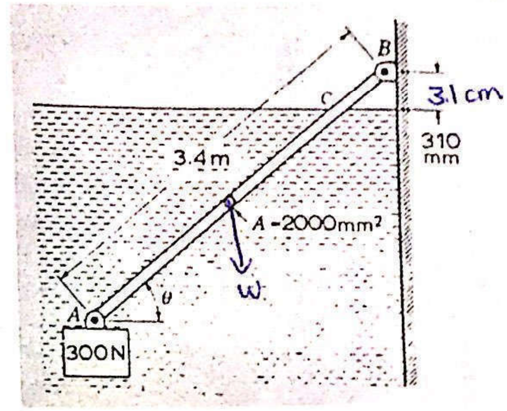
$$= 12948.38 \text{ Pa}$$

=

Scanned with CamScanner

blem 3 (30 Points): ABET SO(e)

A block of wood having a volume of 0.034 m^3 and weighing 300 N is suspended in water as shown in the figure below. A wood rod of length 3.4 m and cross sectional area of 2000 mm^2 is attached to the weight, and also to the wall. If the rod weighs 16 N what will be the angle θ for the block to be in equilibrium?



~~weigh of the rod = ρgV~~

~~= 1000(9.8)(0.034)~~

~~= 333.2~~

~~and it's direction on mid of the rod~~

2000 mm mm × 1 m / 1000 mm × 1 / 1000 mm

* weigh of the rod = 16N

* 300N = ρgV

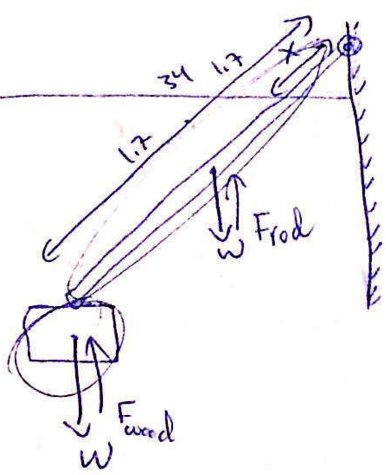
300 = ρ(9.8)(0.034)

ρ_{wood} = 900.36

$F_{wood\ block} = \rho_w g V$

= 1000 (9.8)(0.034)

F_{block} = 333.2 N



-2

$F_{rod} = \rho_{wood}\, g\, (2000)(3.4 - x) \times 10^{-6}$

= ~~17647058.82(3.4 − x)~~ 17.65(3.4 − x)

= (59.9 − 17.65 x)

Flip the page