

BITS Pilani, Dubai Campus
Dubai International Academic City, Dubai

FIRST SEMESTER 2013 – 2014

TEST 1 (CLOSED BOOK)

Year : 2nd Year
Course No. : CHE F212 / ME F212
Course Title : Fluid Mechanics

Date : 26.09.2013
Max. Marks : 50 (25%)
Duration : 50 minutes

Note: i. Answer all the questions.
ii. Take $\rho_{water} = 1000 \text{ kg/m}^3$ and $g = 9.81 \text{ m/s}^2$

1. a. Distinguish between density and specific volume. [4 M]

- b. If V is velocity, l is length, ν is kinematic viscosity, find the unit of $\frac{\nu l}{V}$ [4 M]

2. A block of weight W slides down an inclined plane while lubricated by a thin film of oil, as shown in Fig.Q2. The film contact area with the block is A and its thickness is h . Assuming a linear velocity distribution in the film, derive an expression for the terminal (zero acceleration) velocity V of the block. Find the terminal velocity if the block mass is 6 kg, $A = 35 \text{ cm}^2$, $\theta = 15^\circ$ and the film is 1 mm thick SAE 30 oil at 20°C with viscosity 0.29 Ns/m². [14 M]

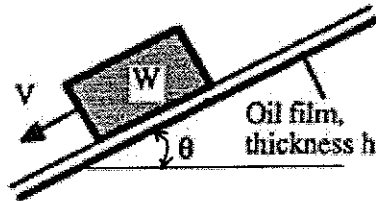


Fig.Q2

3. The velocity distribution for flow over a plate is given by $u = 2y - 5y^2$, where u is the velocity in m/s at a distance y meters above the plate. Draw the velocity profile and determine the velocity gradient and shear stress at the boundary and 0.15 m above it. Take $\mu = 0.9 \text{ Ns/m}^2$. [14 M]

4. A rectangular tank, open to the atmosphere is filled with water to a depth of 2.5 m as shown in Fig. Q4. A U-tube manometer is connected to the tank at a location 0.7 m above the tank bottom. If the zero level of the Meriam blue (S.G. = 1.75) manometer fluid is 0.2 m below the connection, determine the deflection L after the manometer is connected and all the air has been removed from the connecting leg. [14 M]

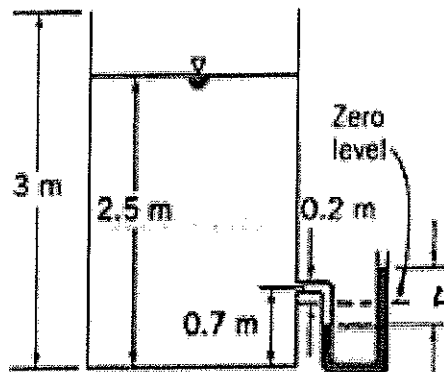


Fig.Q4

BITS Pilani, Dubai Campus
Dubai International Academic City, Dubai

FIRST SEMESTER 2013 – 2014

QUIZ 1 (CLOSED BOOK)

Year : 2nd Year
Course No. : CHE F212/ME F212
B.Course Title : Fluid Mechanics

Date : 10.10.2013
Max. Marks : 16 (8 %)
Duration : 20 minutes

STUDENT NAME:-----I.D No:-----

Instructor Name:----- Sec No:-----

Q.1 An open tank contains water (Fig.1) upto a depth of 2 m and above it an oil of sp.gr.0.9 for a depth of 1m. Find the pressure intensity at the bottom of the tank. Assume density of water 1000 kg/m^3 . [4 M]

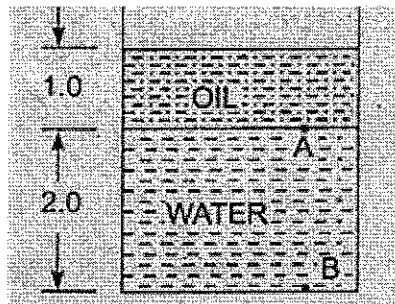


Fig.1

Answer

Q.2. The tendency for an immersed body to be lifted up in the fluid, due to an upward force opposite to the action of gravity is known as [1 M]

- (a) buoyancy (b) centre of buoyancy (c) centre of gravity
(d) centre of pressure

Q.3. Surface tension is caused by _____ [1 M]

- (a) force of repulsion at the free surface (b) capillary action at the surface
(c) Imbibition action of one fluid by another immiscible fluid.
(d) force of cohesion at the free surface

Q.4. Find the surface tension in a soap bubble of 40mm diameter when the inside pressure is 2.5 N/m^2 above atm pressure. [3 M]

Answer

Q.5 The viscosity of liquids _____ with increase in temperature. [1 M]

- (a) decreases (b) increases (c) first decreases and then increases
(d) first increases and then decreases

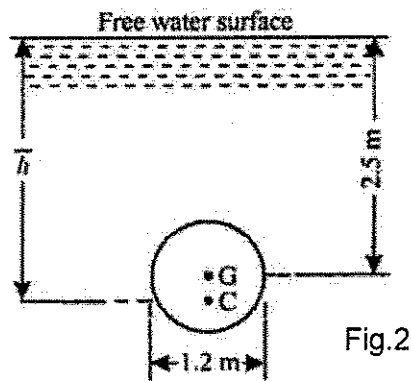
Q.6. Define *Archimedes'* principle:

[2 M]

Answer

Q.7. Fig.2 shows a circular plate of diameter 1.2 m placed vertically in water in such a way that the centre of the plate is 2.5 m below the free surface of water. Determine the position of centre of pressure.

[4 M]



Answer