

1. A rectangular block weighing 160 N slides down a  $30^\circ$  inclined plane which is lubricated by a 1 mm thick film of oil of relative density 0.85 and viscosity 8 poise.

Determine the terminal velocity of the block if the contact area is  $1\text{ m}^2$ .

2. Velocity of fluid in a viscous flow over a plate is given by the following function.

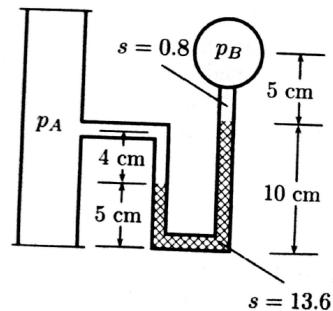
$$u = 5y - \frac{y^2}{2} \text{ m/s}$$

where  $y$  (m) is the distance of the point from bottom surface. If the coefficient of dynamic viscosity is  $2.15 \text{ Pa s}$ . Determine the shear stress at  $y = 3 \text{ m}$ .

3. Surface tension at air-water interface is  $0.073 \text{ N/m}$ . Determine the excess pressure in an air bubble of diameter  $0.02 \text{ mm}$ .
4. A circular annular plate having outer and inner diameter of  $2.5 \text{ m}$  and  $1.25 \text{ m}$ , respectively, is immersed in water with its plane making an angle of  $45^\circ$  with the horizontal. The centre of the circular annular plate is  $2.0 \text{ m}$  below the free surface.

What is the hydrostatic thrust on one side of the plate?

5. A pressure gauge (B) filled with oil is used to measure the pressure at point A in a water main. If the pressure recorded is  $p_B = 100 \text{ kPa}$ , determine the pressure at point A.



6. The surface tension of water at  $20^\circ \text{C}$  is  $75 \times 10^{-3} \text{ N/m}$ . The difference in the water surfaces within and outside an open-ended capillary tube of  $1 \text{ mm}$  internal bore, inserted at the water surface would nearly be
- (a) 5 mm      (b) 10 mm  
(c) 15 mm    (d) 20 mm
7. Match List-1 with List-II and select the correct answer using the code given below the lists.

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**List - 1**

- A. Specific Gravity
- B. Coefficient of viscosity
- C. Kinematic viscosity
- D. Stress

**List - II**

- 1.  $M^0 L^2 T^{-1}$
- 2.  $M^0 L^0 T^0$
- 3.  $ML^{-1} T^{-1}$
- 4.  $ML^{-1} T^{-2}$

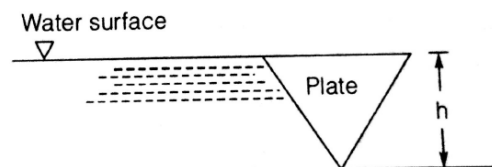
**Code:**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>(a)</b>	2	3	1	4
<b>(b)</b>	4	3	1	2
<b>(c)</b>	2	1	3	4
<b>(d)</b>	4	1	3	2

8. Which one of the following statements is correct?

- (a) Dynamic viscosity is the property of a fluid which is not in motion.
- (b) Surface energy is fluid property giving rise to the phenomenon of capillarity in water
- (c) Cavitation results from the action of very high pressure
- (d) Real fluids have lower viscosity than ideal fluids

9. An equilateral triangular plate is immersed in water as shown in the figure below. The centre of pressure below the water surface is at a depth of



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(a)  $\frac{3h}{4}$       (b)  $\frac{h}{3}$

(c)  $\frac{2h}{3}$       (d)  $\frac{h}{2}$

**10.** A pressure gauge reads 57.4 kPa and 80 kPa, respectively at height of 8 m and 5 m fitted on the side of a tank filled with liquid. What is the approximate density of the liquid in  $\text{kg/m}^3$ ?

- (a) 393      (b) 768  
(c) 1179      (d) 7530