

Handwritten: 10/05/13
20-01-13

1. (a) What is the difference between an ideal and a real fluid? [1x3=3]

(b) What is vapour pressure?

(c) Define manometer and what are the different types of manometers?

(d) Define the following terms:

- (i) Total pressure
- (ii) Centre of pressure

(e) What is buoyancy?

(f) State and explain Newton's law of viscosity.

(g) The space between two parallel plates 5mm apart is filled with crude oil ($S=0.9$). A force of 2 N is required to drag the upper plate at a constant velocity of 0.8 m/s. The lower plate is stationary. The area of the upper plate is 0.09 m^2 . Determine: (i) The dynamic viscosity, and (ii) the kinematic viscosity of the oil in Stokes.

Handwritten: $\mu = 0.84 \text{ Poise}$
 $\nu = 0.84 \times 10^{-4} \text{ m}^2/\text{s}$

(h) What is capillarity? Derive an expression for height of capillary rise.

(i) A soap bubble of 50 mm diameter has an internal pressure in excess of the outside pressure of 25 N/m^2 . Calculate tension in the soap film.

(j) State and prove Pascal's Law.

(k) Define the following terms:

- (i) Atmospheric pressure
- (ii) Gauge pressure
- (iii) Vacuum pressure
- (iv) Absolute pressure

Handwritten: $p_{\text{abs}} = p_{\text{atm}} + p_{\text{gauge}}$

5. (a) Convert a pressure head of 100 m of water to 13.95 bar [2.5+2.5=5]

(i) Kerosene of specific gravity 0.81, and 62.5

(ii) Carbon tetrachloride of specific gravity 1.6. [2.5]

(b) A tank contains water upto a height of 0.5 m above the base. An immiscible liquid ($S=0.8$) is filled on the top of water upto 1 m height. Calculate: (i) Total pressure on one side of the tank, and (ii) the position of centre of pressure. Width of the tank is 2 m. [2.5]

Handwritten: 18148.5 0.92 [2.5+2.5=5]

(c) A circular plate of diameter 3 m is submerged in water in such a way that the greatest and least depths of the surface (below water surface) are 2 m and 1 m respectively. Calculate: (i) The total pressure on front face of the plate, and (ii) the position of centre of pressure. [2.5]

(d) A cube of 50 cm side is inserted in a two layer fluid with specific gravity 1.2 and 0.9 respectively. The upper and lower halves of the cube are composed of materials with specific gravity 0.6 and 1.4 respectively. What is the distance of the top of the cube from the interface? [2.5]