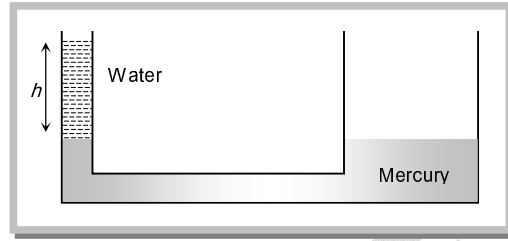


FLUID MECHANICS

1. Two communicating vessels contain mercury. The diameter of one vessel is n times larger than the diameter of the other. A column of water of height h is poured into the left vessel. The mercury level will rise in the right-hand vessel ($s =$ relative density of mercury and $\rho =$ density of water) by

- (a) $\frac{n^2 h}{(n+1)^2 s}$
 (b) $\frac{h}{(n^2+1)s}$
 (c) $\frac{h}{(n+1)^2 s}$
 (d) $\frac{h}{n^2 s}$



2. A triangular lamina of area A and height h is immersed in a liquid of density ρ in a vertical plane with its base on the surface of the liquid. The thrust on the lamina is

- (a) $\frac{1}{2} A \rho g h$ (b) $\frac{1}{3} A \rho g h$ (c) $\frac{1}{6} A \rho g h$ (d) $\frac{2}{3} A \rho g h$

3. Pressure applied to an enclosed fluid is transmitted undiminished to every portion of the fluid and the walls of the containing vessel. This law was first formulated by

- (a) Bernoulli (b) Archimedes (c) Boyle (d) Pascal

4. A uniform rod of density ρ is placed in a wide tank containing a liquid of density ρ_0 ($\rho_0 > \rho$). The depth of liquid in the tank is half the length of the rod. The rod is in equilibrium, with its lower end resting on the bottom of the tank. In this position the rod makes an angle θ with the horizontal

- (a) $\sin \theta = \frac{1}{2} \sqrt{\rho_0 / \rho}$ (b) $\sin \theta = \frac{1}{2} \cdot \frac{\rho_0}{\rho}$ (c) $\sin \theta = \sqrt{\rho / \rho_0}$ (d) $\sin \theta = \rho_0 / \rho$

5. A rectangular block is $5 \text{ cm} \times 5 \text{ cm} \times 10 \text{ cm}$ in size. The block is floating in water with 5 cm side vertical. If it floats with 10 cm side vertical, what change will occur in the level of water?

- (a) No change (b) It will rise
 (c) It will fall (d) It may rise or fall depending on the density of block

6. A ball whose density is $0.4 \times 10^3 \text{ kg/m}^3$ falls into water from a height of 9 cm . To what depth does the ball sink

- (a) 9 cm (b) 6 cm (c) 4.5 cm (d) 2.25 cm

7. The density ρ of water of bulk modulus B at a depth y in the ocean is related to the density at surface ρ_0 by the relation

- (a) $\rho = \rho_0 \left[1 - \frac{\rho_0 g y}{B} \right]$ (b) $\rho = \rho_0 \left[1 + \frac{\rho_0 g y}{B} \right]$ (c) $\rho = \rho_0 \left[1 + \frac{B}{\rho_0 h g y} \right]$ (d) $\rho = \rho_0 \left[1 - \frac{B}{\rho_0 g y} \right]$

8. With rise in temperature, density of a given body changes according to one of the following relations

- (a) $\rho = \rho_0 [1 + \gamma d \theta]$ (b) $\rho = \rho_0 [1 - \gamma d \theta]$ (c) $\rho = \rho_0 \gamma d \theta$ (d) $\rho = \rho_0 / \gamma d \theta$

9. In a turbulent flow, the velocity of the liquid molecules in contact with the walls of the tube is

- (a) Zero (b) Maximum
 (c) Equal to critical velocity (d) May have any value

10. In a streamline flow

- (a) The speed of a particle always remains same
 (b) The velocity of a particle always remains same
 (c) The kinetic energies of all the particles arriving at a given point are the same
 (d) The moments of all the particles arriving at a given point are the same

11. At what speed the velocity head of a stream of water be equal to 40 cm of Hg

- (a) 1032.6 cm/sec (b) 432.6 cm/sec (c) 632.6 cm/sec (d) 832.6 cm/sec

12. The weight of an aeroplane flying in air is balanced by

- (a) Upthrust of the air which will be equal to the weight of the air having the same volume as the plane
 (b) Force due to the pressure difference between the upper and lower surfaces of the wings, created by different air speeds on the surface

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- (c) Vertical component of the thrust created by air currents striking the lower surface of the wings
(d) Force due to the reaction of gases ejected by the revolving propeller
13. A rectangular vessel when full of water takes 10 minutes to be emptied through an orifice in its bottom. How much time will it take to be emptied when half filled with water
(a) 9 minute (b) 7 minute (c) 5 minute (d) 3 minute
14. A vessel of area of cross-section A has liquid to a height H . There is a hole at the bottom of vessel having area of cross-section a . The time taken to decrease the level from H_1 to H_2 will be
(a) $\frac{A}{a} \sqrt{\frac{2}{g}} [\sqrt{H_1} - \sqrt{H_2}]$ (b) $\sqrt{2gh}$ (c) $\sqrt{2gh(H_1 - H_2)}$ (d) $\frac{A}{a} \sqrt{\frac{g}{2}} [\sqrt{H_1} - \sqrt{H_2}]$
15. Two capillary tubes of the same length but different radii r_1 and r_2 are fitted in parallel to the bottom of a vessel. The pressure head is P . What should be the radius of a single tube that can replace the two tubes so that the rate of flow is same as before
(a) $r_1 + r_2$ (b) $r_1^2 + r_2^2$ (c) $r_1^4 + r_2^4$ (d) None of these