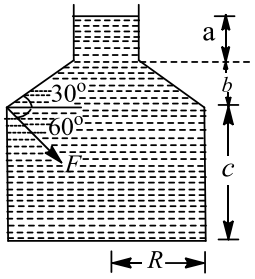
SAFE HANDS
ASSIGNMENT – 08 (28-03-2020)

1. A jar shown in figure is filled with a liquid of density ρ. The jar is placed in vacuum. Cross-section of the jar is circular and base is having a radius R. The force exerted by the liquid column on the base of the jar is



a) $\rho\ g(a+b+c)\pi R^2$ b) Less than $\rho\ g(a+b+c)\pi R^2$
c) Greater than $\rho\ g(a+b+c)\pi R^2$ d) $2\rho\ g(a+b+c)\pi R^2$

2. Water flows steadily through a horizontal pipe of variable cross-section. If the pressure of water is p at a point where flow speed is v, the pressure at another point where the flow of speed is $2v$, is (take density of water as ρ)

a) $p-\frac{3\rho v^2}{2}$ b) $p-\frac{\rho v^2}{2}$ c) $p-\frac{3\rho v^2}{4}$ d) $p-\rho v^2$

3. A horizontal pipe of non-uniform cross-section allows water to flow through it with a velocity $1\ ms^{-1}$ when pressure is 50 kPa at a point. If the velocity of flow has to be $2\ ms^{-1}$ at some other point, the pressure at that point should be

a) 50 kPa b) 100 kPa c) 48.5 kPa d) 24.25 kPa

4. Three liquids of equal masses are taken in three identical cubical vessels A, B and C. Their densities are ρ_A, ρ_B and ρ_C respectively but $\rho_A < \rho_B < \rho_C$. below the force extract by the liquid on the base of cubical vessel is

a) maximum in vessel C b) maximum in vessel C
c) the same in all the vessels d) maximum in vessel A

5. The excess pressure inside one soap bubble is three times that inside a second soap bubble, then the ratio of their surface areas is

a) 1:9 b) 1:3 c) 3:1 d) 1:27

6. A concrete sphere of radius R has a cavity of radius r which is packed with sawdust. The specific gravities of concrete and sawdust are respectively 2.4 and 0.3 for this sphere to float with its entire volume submerged under water. Ratio of mass of concrete to mass of sawdust will be

a) 8 b) 4 c) 3 d) Zero

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7. A man is carrying a block of a certain substance (of density 1000 kgm^{-3}) weighing 1 kg in his left hand and a bucket filled with water and weighing 10 kg in the right hand. He drops the block into the bucket. How much load does he carry in his right hand now
   a) 9 kg b) 10 kg c) 11 kg d) 12 kg
8. A horizontal pipe line carries water in streamline flow. At a point where the cross-sectional area is 10 cm^2 the water velocity is 1 ms^{-1} and pressure is 2000 Pa. The pressure of water at another point where the cross-sectional area is 5 cm^2, is
   a) 200 Pa b) 400 Pa c) 500 Pa d) 800 Pa
9. Two rain drops reach the earth with different terminal velocities having ratio 9:4. Then the ratio of their volume is
   a) 3:2 b) 4:9 c) 9:4 d) 27:8
10. Radius of one arm of hydraulic lift is four times of radius of other arm. What force should be applied on narrow arm to lift 100kg?
    a) 26.5 N b) 62.5 N c) 6.25 N d) 8.3 N
11. The terminal speed of a sphere of gold (density $= 19.5$ kg m^{-3}) is 0.2 ms^{-1} in a viscous liquid (density $= 1.5$ kg m^{-3}). Then the terminal speed of a sphere of silver (density $= 10.5$ kg m^{-3}) of the same size in the same liquid is
    a) 0.1 ms^{-1} b) 1.133 ms^{-1} c) 0.4 ms^{-1} d) 0.2 ms^{-1}
12. Two soap bubbles combine to form a single bubble. In this process, the change in volume and surface area are respectively V and A. If p is the atmospheric pressure, and T is the surface tension of the soap solution, the following relation is true.
    a) $4pV + 3TA = 0$ b) $3pV - 4TA = 0$ c) $4pV - 3TA = 0$ d) $3pV + 4TA = 0$
13. What change in surface energy will be noticed when a drop of radius R splits up into 1000 droplets of radius r, surface tension T?
    a) $4\pi R^2T$ b) $7\pi R^2T$ c) $16\pi R^2T$ d) $36\pi R^2T$
14. A vessel whose bottom has round holes with diameter of 1 mm is filled with water. Assuming that surface tension acts only at holes, then the maximum height to which the water can be filled in vessel without leakage is (Surface tension of water is 75×10^{-3} Nm^{-1} and g $=$ 10 ms^{-2})
    a) 3 cm b) 0.3 cm c) 3 mm d) 3 m

15. A water tank, open to the atmosphere, has a leak in it, in the form of a circular hole, located at a height h below the open surface of water. The velocity of the water coming out of the hole is

    a) $\sqrt{gh/2}$ b) $\sqrt{gh}$ c) $\sqrt{2gh}$ d) $2\sqrt{gh}$