

GATE Mechanical Engineering

Fluid Mechanics ASSIGNMENT – 1- Fluid Properties

1)

A hydraulic press has a ram of 15 cm diameter and plunger of 1.5 cm. It is required to lift a mass of 1000kg. The force required on plunger is nearly equal to

- a) 100N b) 1000N c) 10000N d) 10N

[ISRO-2006]

2)

A metallic cube of side 10 cm, density 6.8 gm/cc is floating in liquid mercury (density 13.6gm/cc), with 5 cm height of cube exposed above the mercury level. Water (density 1 gm/cc) is filled over this, to submerge the cube fully. The new height of cube exposed above mercury level is

- a) 4.6 cm b) 5.4 cm c) 5.0 cm d) 5.8 cm

[ISRO-2006]

3)

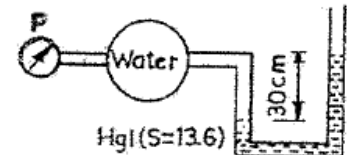
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[ISRO-2006]

4)

In the given figure pressure p , in kPa , is



- (a) 37 (b) 48.0 (c) 45.2 (d) 51.3

[ISRO-2010]

5)

A small plastic boat loaded with pieces of steel rods is floating in a bathtub. If the cargo is dumped into the water allowing the boat to float empty, the water level in the tub will

- (a) Rise (b) Fall (c) Not change (d) Rise then fall

[ISRO-2010]

6)

Four cars, with a mass of 1500 kg each, are loaded on a 6 m wide, 12 m long small car ferry. How far, in cm will it sink in the water?

- (a) 15.2 (b) 11.5 (c) 10.2 (d) 8.3

[ISRO-2010]

7)

Given that:

Specific gravity of mercury = 13.6;

Intensity of pressure = 40 kPa

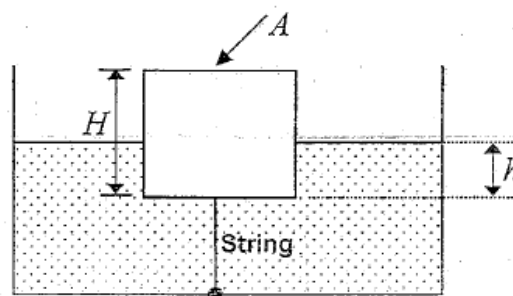
Express the intensity of pressure (gauge) in various units (S.I)

- (a) 0.3 bar, 3.077 m of water, 0.15 m of mercury (b) 0.4 bar, 4.077 m of water, 0.299 m of mercury
 (c) 0.5 bar, 5.077 m of water, 0.339 m of mercury (d) None of the above

[ISRO-2010]

8)

A cylindrical body of cross-sectional area A height H and the density ρ_s is immersed to a depth h in a liquid of density ρ , and tied to the bottom with a string. The tension in the string is



- a) ρghA b). $(\rho h - \rho_s H)gA$ c) $(\rho - \rho_s)ghA$ d) $(\rho_s - \rho)ghA$

[ISRO-2011]

9)

A manometer measures the pressure differential between two locations of a pipe carrying water. If the manometric liquid is mercury (specific gravity 13.6) and the manometer showed a level difference of 20 cm, then the pressure head difference of water between the two tapings will be

- a) 1.26 m b) 2.72 m c) 1.36 m d) 2.52 m

[ISRO-2011]

10)

If the surface tension of water-air interface is 0.073 N/m , the gauge pressure inside a rain drop of 1 mm diameter will be

- a) 0.146 N/m^2 b) 73 N/m^2 c) 146 N/m^2 d) 292 N/m^2

[ISRO-2011]

11)

The diameter of a soap bubble which has an inside pressure of 2.5 N/m^2 over the atmospheric pressure and a surface tension of 0.0125 N/m is

- (a) 40 mm (b) 4 mm (c) 16 mm (d) 60 mm

[ISRO-2012]

12)

A spherical balloon is filled with helium at sea level. Helium and balloon material together weigh 500 N . If the net upward lift force on the balloon is also 500 N , what is the diameter of the balloon?

- (a) 5.42 m (b) 6.78 m (c) 3.43 m (d) 2.34 m

[ISRO-2012]

13)

An increase in pressure of a liquid from 7.5 MPa to 15 MPa results into 0.2 percent decrease in its volume. The coefficient of compressibility of the liquid in m^2/N is

- a) 0.267×10^{-9} b) 2.67×10^{-9} c) 1×10^{-9} d) None of the above.

[ISRO-2012]

14)

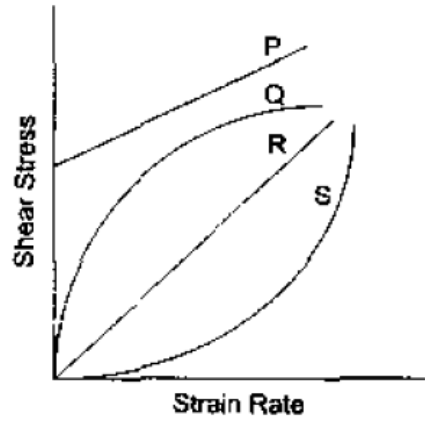
A reservoir of capacity 0.01 m^3 is completely filled with a fluid of coefficient of compressibility $0.75 \times 10^{-9} \text{ m}^2/\text{N}$. The amount of fluid that will spill over (in m^3), if pressure in the reservoir is reduced by $2 \times 10^7 \text{ N/m}^2$ is

- a) 1×10^{-4} b) 1.5×10^{-4} c) 0.15×10^{-4} d) None of the above

[ISRO-2012]

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15) The Rheological diagram depicting the relation between shear stress and strain rate for different types of fluids is shown in the figure below.



The most suitable relation for flow of tooth paste being squeezed out of the tube is given by the curve

- (A) P (B) Q (C) R (D) S

[GATE-XE-2010]

16) Two walls are holding back water as shown in the figures below. The resisting moments per unit length of the walls at points P and Q are M_P and M_Q . Denoting the specific weight of water as γ , the difference in the moments ($M_Q - M_P$) is



- (A) $\frac{\sqrt{3}\gamma h^3}{2}$ (B) $\frac{2\gamma h^3}{\sqrt{3}}$ (C) $\frac{\gamma h^3}{18}$ (D) $\frac{\gamma h^3}{2}$

[GATE-XE-2010]