

UNIVERSITY COLLEGE OF ENGINEERING : BURLA

MIDTERM EXAMINATION  
2<sup>ND</sup> SEMESTER (SECTION-A)  
SUB: FLUID MECHANICS

TIME : 2 HOURS

FULL MARKS: 20

(ANSWER ANY FOUR QUESTIONS INCLUDING Q. NO. 1)

**Q.1.** Answer all questions:

- a] An inclined plate is 2m long and 1m wide. It lies with its length inclined at  $45^\circ$  to the surface of water and the nearest edge 1m below it. If the specific weight of water is  $1000\text{kg/m}^3$ , then find the approximate total pressure on the plate (in Kg).
- b] A rectangular floating body 20m long is 5m wide. The water line is 1.5m above the bottom. If the centre of gravity is 1.8m from the bottom, then find its metacentric height.
- c] What do you mean by vacuum pressure? Explain by means of a neat labelled diagram.
- d] A hollow hemispherical object of diameter D is immersed in water with its plane surface coinciding with the free surface of water. Find the vertical component of force on the curved surface.
- e] Barometric pressure at sea level is 760mm Hg. and at the mountain top is 735mm Hg. If specific weight of air is  $11.77\text{N/m}^3$ , compute the elevation of the mountain top.

[1x5 = 5]

### Q.2

- a] An inclined circular gate of diameter 1m , with water on one side, is inclined at an angle of  $45^\circ$  to the horizontal axis with side elevation being shown in the *figure-1*. Determine the total resultant force acting on the gate and the location of the centre of pressure. The top of the gate is 1.5m below the water surface.

[3]

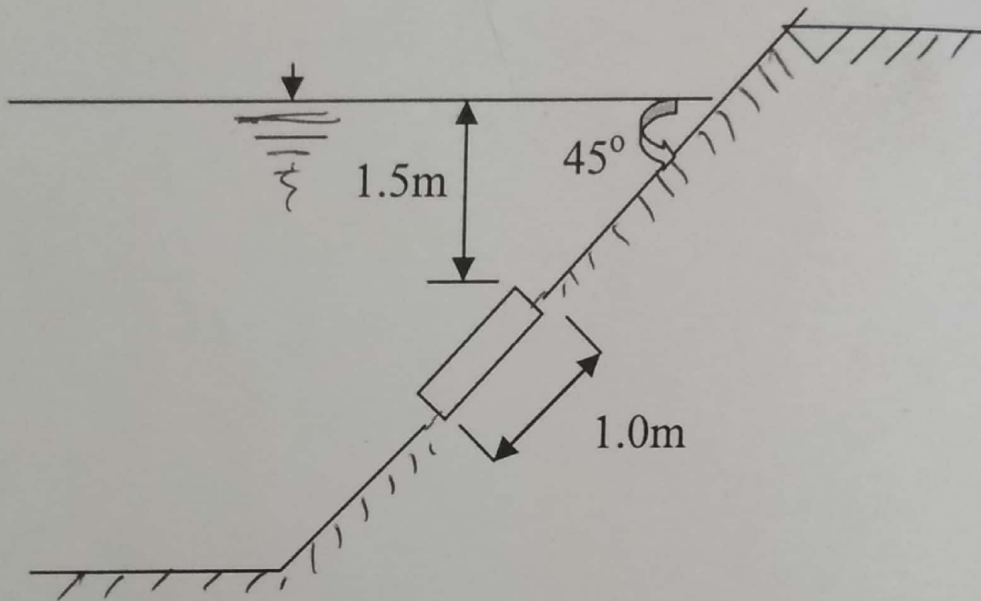


Figure-1

- b] What do you mean by stability of floating bodies? Explain with neat labeled diagrams.

[2]

### Q3.

- a] A dash pot of diameter 120mm and 150mm long moves in a cylinder of diameter 120.4mm. The oil filling the annular space has a viscosity of 0.8 poise and the load on the piston is 10N. Find the speed with which the piston slides down.

[3]

b) If an aeroplane is moving with 800kmph through air, determine the flow regime, if the velocity of sound in air is 340m/s. What is the value of Mach Number?

[2]

**Q4.**

a) A long rigid pipe of diameter 0.3m is used for pumping oil. The pipe is choked at some unknown point, so that the fluid is unable to flow. A piston inserted from one end of the pipe slides without leakage through 0.5m causing an increase of pressure of  $120\text{kN/m}^2$ . Assume  $E_{\text{oil}} = 1.9 \times 10^9 \text{ N/m}^2$ . Determine the approximate location of obstruction.

[3]

b) An upright accelerometer in a horizontal flight has upright open U-tube, which can contain 0.5m mercury in each limb. The limbs of the U-tube are 10cm apart. Find out the range of acceleration up to which it works.

[2]

**Q5.**

a) A wooden cylinder of 1m diameter, floats in water. What should be its maximum height so that it may float upright with its longitudinal axis vertical? The specific gravity of wood is 0.6.

[3]

b) An open rectangular tank of size 5m x 4m x 3m high containing water upto a height of 2m is accelerated horizontally along the longer side. Determine the maximum acceleration that can be given without spilling the water.

[2]

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