Fluid Mechanics (GATE 2018)

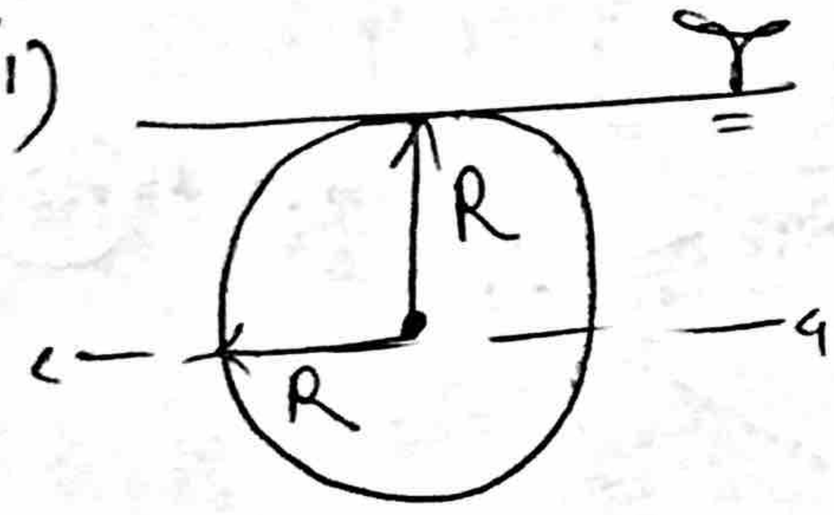
FLUID STATICS (Practice Questions)

Write Down the deeivation which I have explained in the Video of force on plane Submeged Surface. ⇒ 10 marks.

Q1: Calculate the Centre of Pressure for the following Cases ⇒

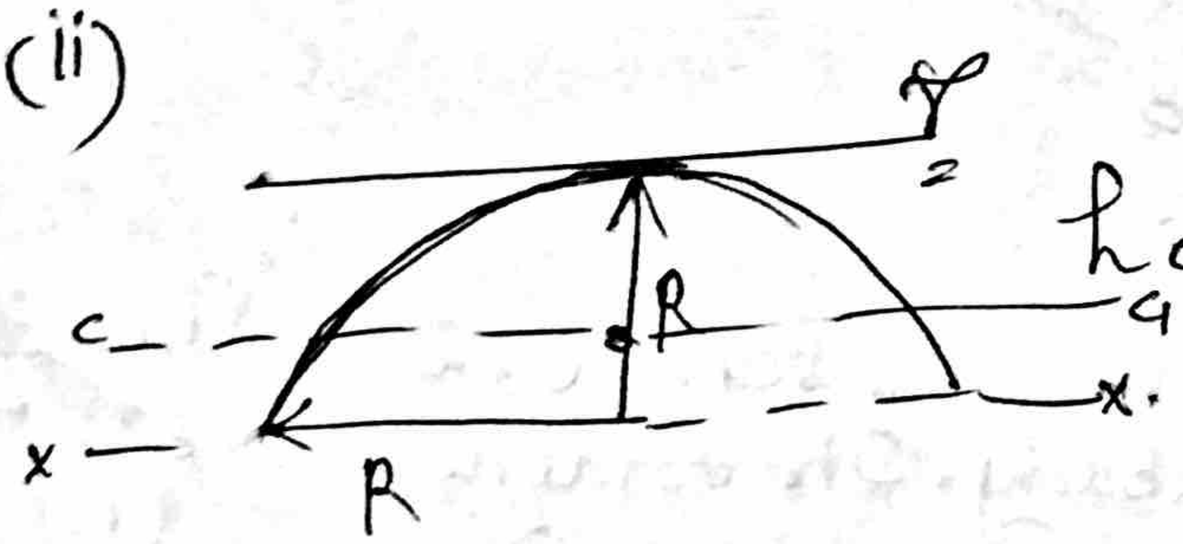
hcp = ?

(i)



$\bar{h}_{cp}$ = ?

(ii)



h_{cp} = ?

Hint

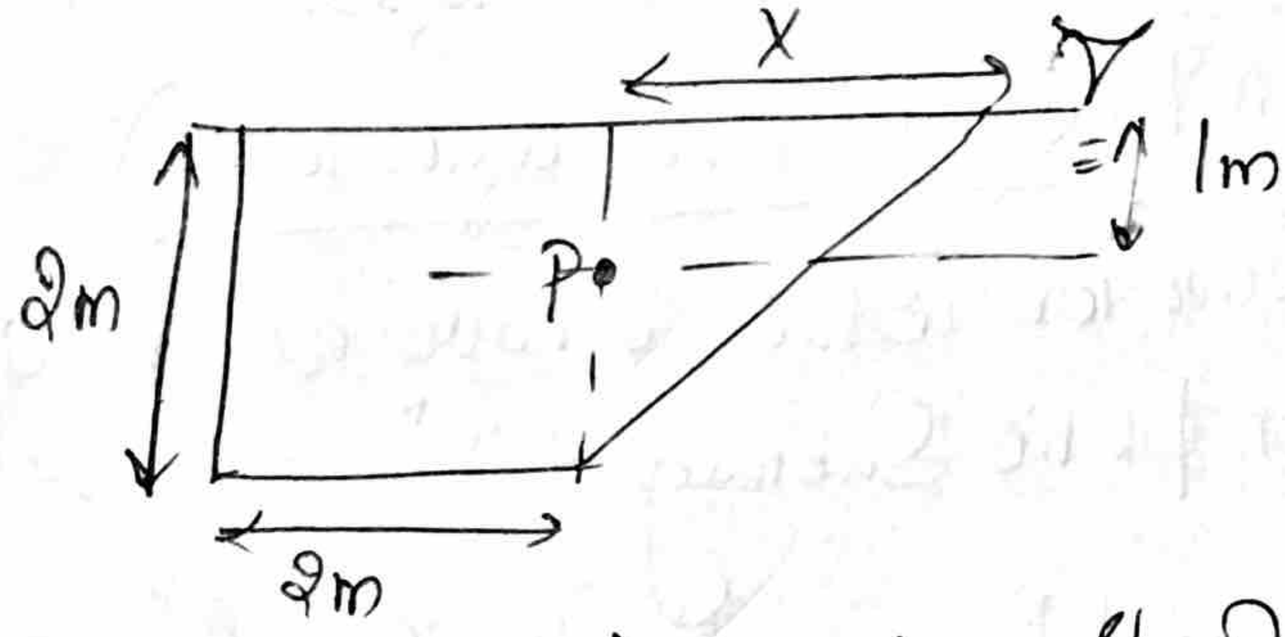
(i) C.G ⇒ $\frac{4R}{3\pi}$ from base.

(ii) parallel axis Theorm will be used for $I_{C.G}$ = ?

Q2: An isoceles triangular plate 4m base and 6m altitude is immersed Vertically in Water. The axis of Symmetry is parallel and at a depth of 6m from the Surface of free water Surface. Calculate the magnitude and location of total Pressure force?

Q3: Cross-section of an object (having Same Section normal to the paper) Submerged into fluid consist of a square of Side 2m and triangle as shown. The object is hinged at point P, that is one meter below the fluid free surface. If the object is to be kept in the position as shown in the figure, then what will be the value of 'x' →

(a) $2\sqrt{3}$m (b) $4\sqrt{3}$m (c) 4m (d) 8m.

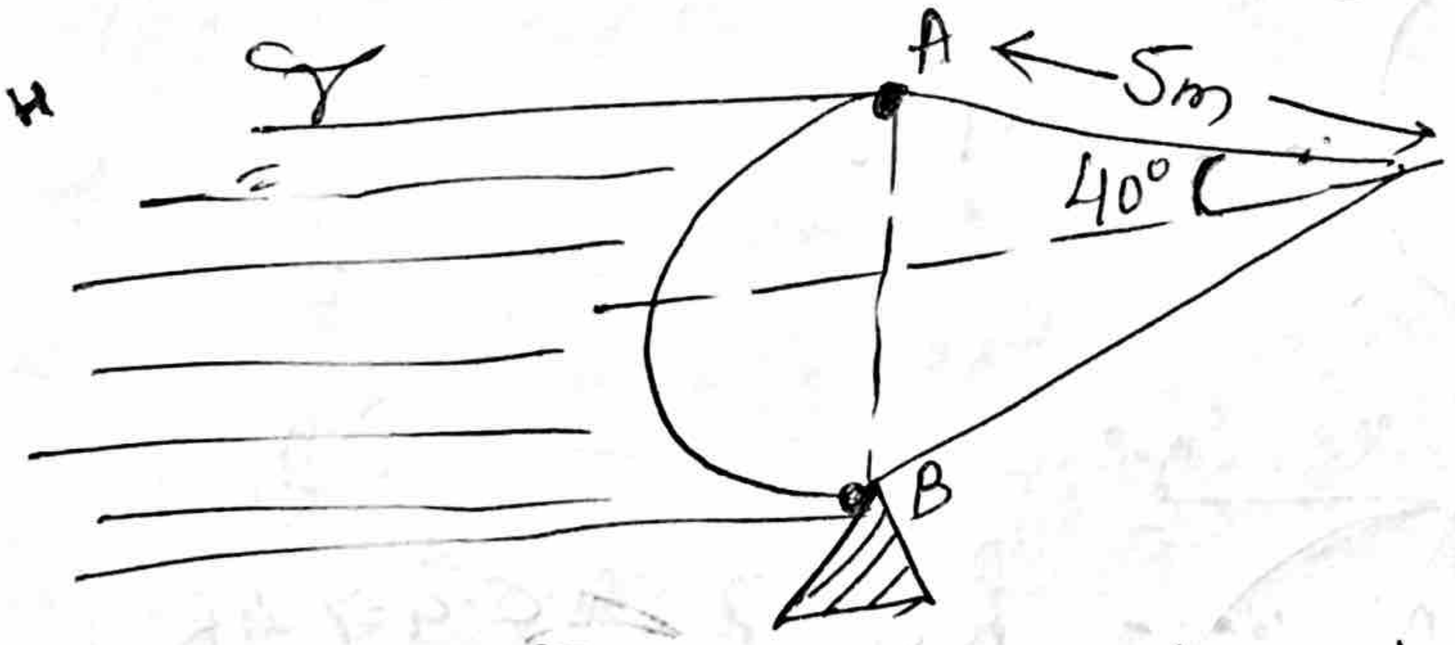


Hint
Moment about hinge from both sides is equal.

Q48⇒ A Sector gate is provided as shown, what will be the resultant force per mt (KN/m) on the gate by fluid.

GATE is (AB)

Hint
$F_H = \rho g \bar{h} \cdot A_H$
$F_V = \rho g \cdot V$



Q5: for a cylinder floating with its axis vertical, what should be the condition for the stability. The total height of Cylinder is 'H', with a certain depth below the surface of fluid. The relative density of Cylinder body w.r.t fluid is 'S'. Radius of Cylinder is R.

PROVE⇒ $\frac{H}{R} < \sqrt{\frac{2}{S(1-S)}}$

⇓

Remember relation directly for obj.

Hint

Stability ⇒

(i) $F_{rep} = mg$
$\Rightarrow m \cdot g = \rho_{fluid} g \cdot V_{sp}$

(ii) $GM > 0$
$BM - BG > 0$
$\frac{I}{V} - BG > 0$