

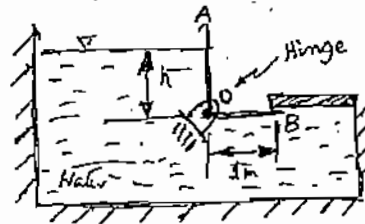
DEPARTMENT OF APPLIED MECHANICS

Mechanics of solids and fluids: AML-150
Major Test: Semester II: Session 2007-2008
(Fluid Mechanics part)

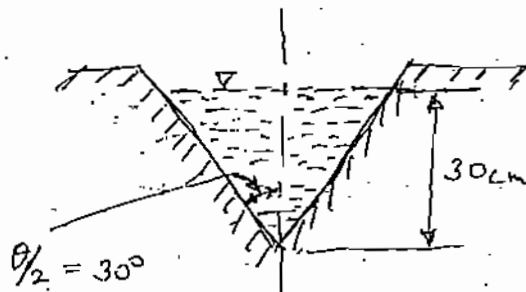
Time: 1 hr
Max. Marks: 40

Note: Answer any four questions. All questions carry equal marks. Approved formulae sheet may be consulted freely.

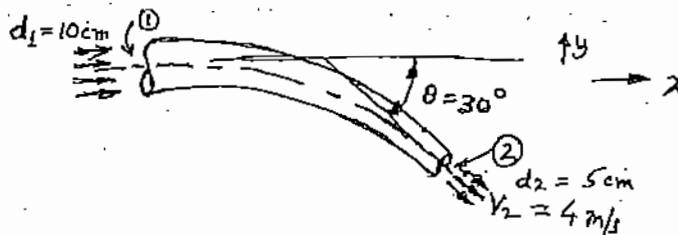
- Q1) A rectangular gate AOB, hinged at 'O' as shown, should tip automatically when the water rises above a certain level. Determine that level in terms of 'h'. Width of the gate is 2 m.



- Q2) Find the discharge of water through the Vee notch shown, with $C_d = 0.6$. Derive any relations used.



- Q3) Water discharges into the atmosphere at the outlet section '2', through the reducing bent nozzle shown. Find the following: (i) Pressure and velocity at inlet section '1'; (ii) The anchoring forces R_x and R_y for the nozzle (Ignore body forces).



- Q4) Starting from the Navier Stokes equations, discuss any one of the following problems, highlighting: (i) basic differential equation; (ii) solution for velocity distribution; (iii) maximum and average velocities, and discharge.
(i) Plane-Poiseuille flow, i.e., flow between fixed parallel plates with pressure gradient.
(ii) Flow through a circular pipe.
- Q5) Find the time taken for the water in the tank, connected to the pipe shown, to fall by half its initial level. Initial level is given as $H = 1$ m. Take the average friction factor as $f = 0.02$, for the attached pipe.

