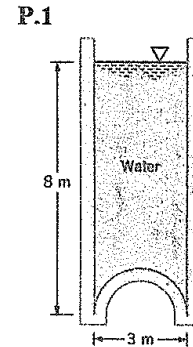


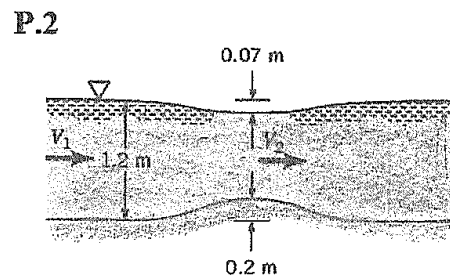
Problem. 1 (25%)

A 3 meter diameter open cylindrical (圓柱型) tank contains water and has a hemisphere (半球型) bottom as shown in P.1. Determine the magnitude, line of action, and direction of the force of the water on the curved bottom.



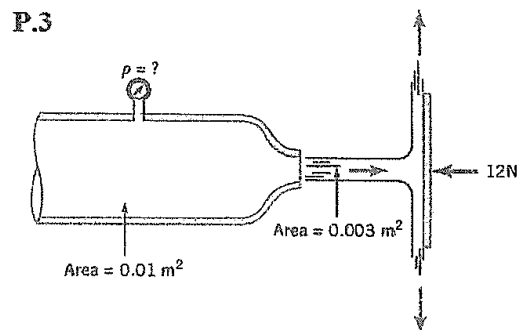
Problem. 2 (25%)

The flowrate in a water channel is sometimes determined by use of a Venturi flume, as shown in P.2. This device consists of a bump on the bottom of the channel. If the water surface dips a distance of 0.07 meter for the conditions shown in P.2, what is the flowrate per width of the channel? Assume the velocity is uniform and viscous effects are negligible.



Problem. 3 (25%)

Air flows into the atmosphere from a nozzle and strikes a vertical plate as shown in P.3. A horizontal force of 12 N is required to hold the plate in place. Determine the reading on the pressure gage. Assume the flow to be incompressible and frictionless. The density of air can be taken as 1.23 kg per cubic meter.



Problem. 4 (25%)

The viscous, incompressible steady flow between the two parallel plates shown in P.4 is caused by a pressure gradient  $\partial p / \partial x$ , which is treated as a constant. Determine the velocity profile between the two fixed plates. Where does the maximum velocity occur? Assume the fluid viscosity is  $\mu$ , the bottom plate is at  $y = 0$  and the top plate is at  $y = b$ .

