Application ID number:

Name:

International Master's Programs in the Graduate School of Engineering, 2025

Screening Examination Questions・Answer Sheet

Subject	Hydraulics

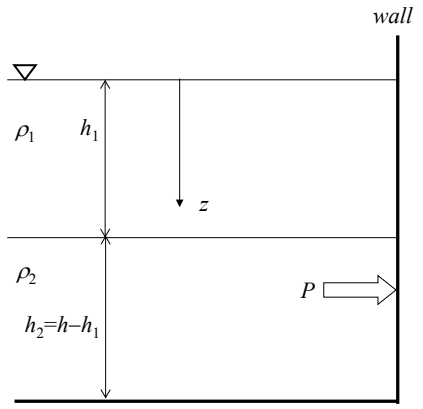
Score

【 Q1 】 Solve the following questions（ 50 points ）

(1) Determine the total pressure P on the side wall under the condition with two liquids of different density in the figure. Here, g is the gravitational acceleration, and ρ_1 and ρ_2 are upper and lower liquids' density in the tank. :

Answer

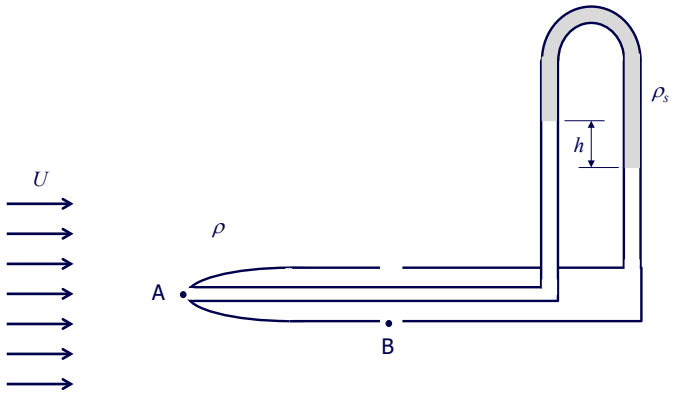
$$\rho_1 g B h_1 \left(h - \frac{h_1}{2}\right) + \frac{\rho_2 g B}{2}(h - h_1)^2$$



(2) In the figure, a hemispherical head Pitot-static tube in uniform water flow with density ρ is shown. The inner tube and the outer tube (sheath) are connected with a U-tube type of gauge filled with a liquid of mass density ρ_s. Obtain water velocity U assuming the Bernoulli's theorem between A and B.

Answer

$$U = \sqrt{2gh}$$



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(3) The water jet in the figure strikes normal to a fixed plate. Neglect gravity and friction, and find the horizontal force F to hold the plate using D (diameter of nozzle), V (velocity), ρ (density of water), and g (gravity acceleration) as necessary.

Answer

$$F=\rho AV^2=\rho\pi D^2V^2/4$$