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淡江大學八十九學年度碩士班招生考試試題

系別：機械工程學系　　科目：流體力學

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1. Explain the following fluid dynamic terms:
   (1) Newtonian fluid
   (2) vorticity
   (3) circulation
   (4) dynamic pressure
   (5) fully developed flow . (15%)

2. Which of the following sets of velocity equations represent possible two-dimensional incompressible flow cases?
   (1) $u = x + y$; $v = x - y$

   (2) $u = x + 2y$; $v = x^2 - y^2$

   (3) $u = 4x + y$; $v = x - y^2$

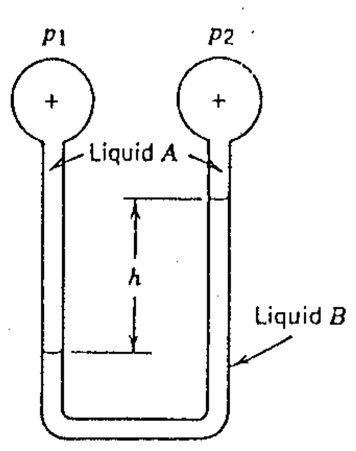
   (4) $u = xt + 2y$; $v = x^2 - yt^2$

   (5) $u = xt^2$; $v = xyt + y^2$ (15%)

3. State the relationship among fluid properties (the Bernoulli equation) that results from applying the momentum equation to a differential control volume. List the restrictions on the use of the Bernoulli equation. (15%)

4. A uniform flow field is inclined at angle α above the x -axis. Evaluate the velocity components u and v. Determine the stream function for the flow field. (15%)

5. The manometer shown contains two liquids. Liquid A has SG = 0.88 and liquid B has SG = 2.95. Calculate the deflection, h , when the applied pressure difference is $p_1 - p_2 = 870$ Pa. (SG is specific gravity. The density of water of water is 999 kg/m^3 . The acceleration of gravity is 9.81 m/sec^2 .) (20%)



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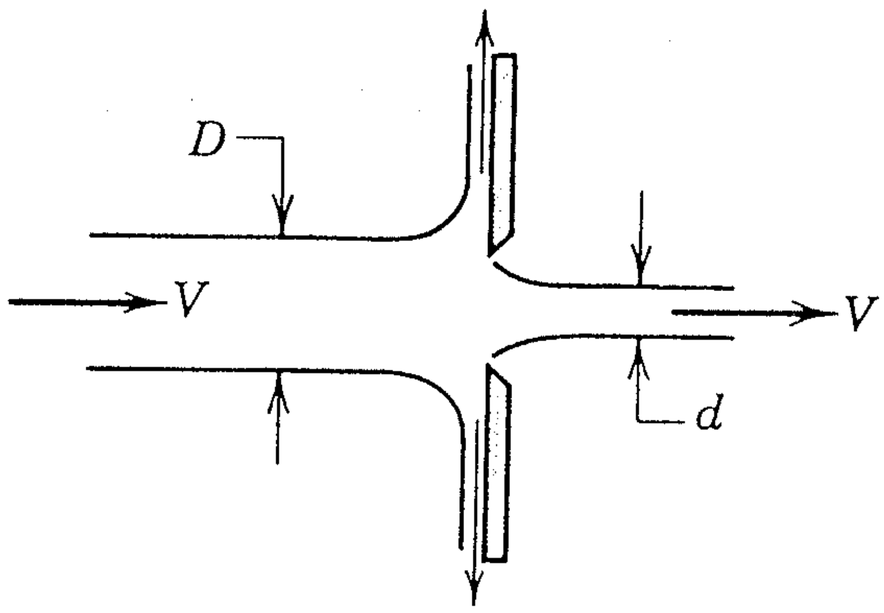
6. A vertical plate has a sharp-edged orifice at its center. A water jet of speed V strikes the plate concentrically. Obtain an expression for the external force needed to hold the plate in place, if the jet leaving the orifice also has speed V. Evaluate the force for V = 5 m/sec, D = 100 mm, and d = 25 mm. (20%)



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