國立中央大學100學年度碩士班考試入學試題卷

所別：水文與海洋科學研究所碩士班不分組(一般生)　科目：流體力學　共 1 頁 第 1 頁

本科考試禁用計算器　　＊請在試卷答案卷（卡）內作答

1. TRUE or False? Give a short explanation of your answer (in Chinese or English)

   (1) (10%) The equation $v=\sqrt{2(p_0-p)/\rho}$ to determine velocity in a total head probe is valid for compressible flows.

   (2) (10%) Fluid particles in the entrance region of pipe flow are accelerating.

2. Consider the vector field $\vec{V}$ and the scalar function Φ

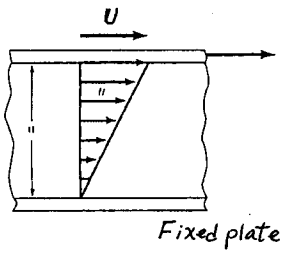
   $\vec{V}=2xy^2\vec{i}+xz^2\vec{j}+z^2\vec{k}$

   $\Phi=x^2+3y^3+5z^4$

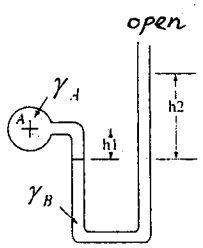
   If it is possible, find the quantities (with derivations) requested below. If it is not possible to find the quantity, write down "not possible".

   (1) (5%) $\nabla\vec{V}$ (2)(5%) $\nabla^2\vec{V}$ (3)(5%) $\nabla\cdot\Phi$ (4)(5%) $\nabla^2\Phi$

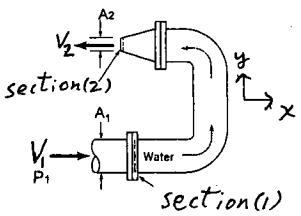
3. (20%) The parallel plates shown on the right have a fluid between them and are separated by a distance of 5 mm. A shearing stress of 100 Pa develops at the upper plate when it is pulled at a velocity of 1 meter/second. Assuming a linear velocity profile between the plates, what is the viscosity of the fluid?



4. (20%) What is the specific weight γ_A of the fluid in pipe A? The manometer is open to the atmosphere. Your answer may include some or all of the following variables:
   γ_B, the specific weight of the manometer fluid
   h1 and h2, the height as indicated
   P_A, the pressure in pipe A
   P_{ATM}, atmospheric pressure



5. (20%) Determine the magnitude and direction of the x and y components of the anchoring force required to hold in place the horizontal 180-degree elbow and nozzle combination shown in the picture.
   At section 1: the pressure is P_1 (gage); the velocity is V_1; the area is A_1
   At section 2: the pressure is atmosphere; the velocity is V_2; the area is A_2



參考用