國立嘉義大學九十七學年度

土木與水資源工程學系碩士班(乙組)招生考試試題

科目：流體力學

說明：1. 如有條件不足之情形，請自行假設。

      2. 僅可使用試務單位提供之計算機。

1. Explain the following terms: (20%)
   (1) Bernoulli equation
   (2) Pathlines
   (3) Minor loss
   (4) Vorticity
   (5) Energy line

2、(a) Please briefly explain the difference between solid and fluid. (5%)

  (b) What are the Newtonian fluid, non-Newtonian fluid, and Bingham plastic material? (5%)

  (c) The velocity distribution for the flow of a Newtonian fluid between two wide, parallel plates (see Fig. 2) is given by the equation

$$u = \frac{3V}{2}\left[1 - \left(\frac{y}{h}\right)^2\right]$$

where V is the mean velocity. The fluid has a viscosity of $0.04 \ \mathrm{lb \cdot s / ft^2}$. When $V = 4 \ \mathrm{ft/s}$ and $h = 0.3 \ \mathrm{in}$, please determine the shearing stress acting on the bottom wall, and the shearing stress acting on a plane parallel to the walls and passing through the centerline (midplane). (10%)
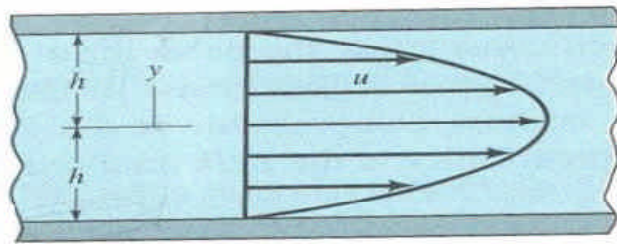

Fig. 2

3、Water flows through a pipe as shown in Fig. 3. The static differential pressure between positions (1) and (2) is measured by the inverted U-tube manometer containing oil of specific gravity, SG, less than one. Determine the manometer reading, h. (20%)
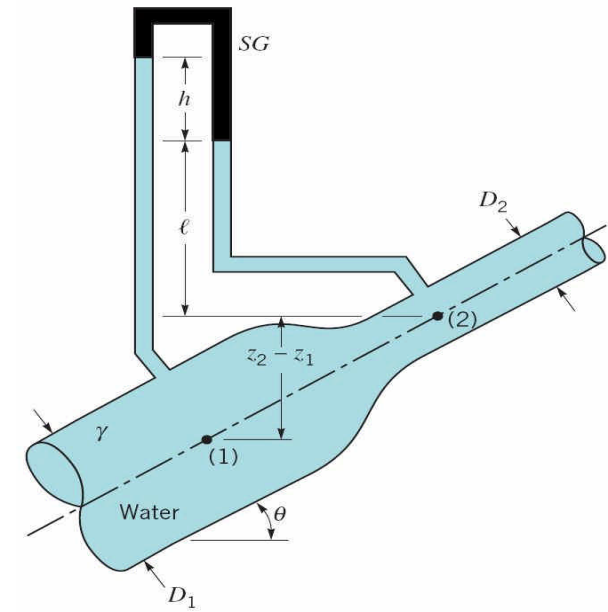

Fig. 3

4、(a) Please derive the Reynolds transport theorem in terms of mass conservation (i.e., the control volume expression for conservation of mass). (10%)

  (b) Please derive the differential form of continuity equation from (a). (10%)

5、The fluid velocity along the x axis shown in Fig. 5 changes from 6 m/s at point A to 10 m/s at point B. It is also known that the velocity is a linear function of distance along the streamline. Determine the acceleration at point A. B. and C. Assume steady flow.(20%)
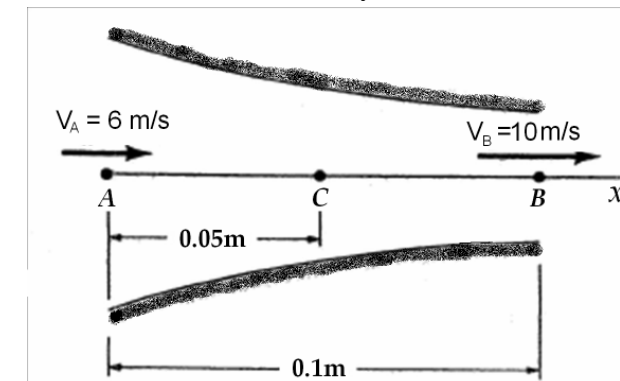

Fig. 5