元智大學 103 學年度研究所 **碩士班** 招生試題卷

系(所)別：機械工程學系碩士班　組別：甲組　科目：流體力學　用紙第 1 頁共 1 頁

●不可使用電子計算機　（盡量作答，請勿空白）

1. 請討論流体力學在工業上的可能用途。(20%)

2. Define and explain (20%)

5%(1) Re　5%(2) Viscosity　5%(3) Navier-Stokes Equation　5%(4) Newtonian fluids

3. Discuss the differences of Laminar and Turbulent Flows. (10%)

4. **GIVEN** The velocity distribution for the flow of a Newtonian fluid between two wide, parallel plates 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 $2\ \text{N}\cdot\text{s/m}^2$. Also, $V = 0.6$ m/s and $h = 5$ mm.

FIND Determine: (a) the shearing stress acting on the bottom wall, and (b) the shearing stress acting on a plane parallel to the walls and passing through the centerline (midplane). (20%)

5. **GIVEN** Water at 15 °C ($\nu = 1.12 \times 10^{-6}\ \text{m}^2/\text{s}$) is to flow from reservoir A to reservoir B through a pipe of length 520 m and roughness 1.5×10^{-4} m at a rate of $Q = 1\ \text{m}^3/\text{s}$ as shown in Fig. 1. The system contains a sharp-edged entrance and four flanged 45° elbows.

FIND Determine the pipe diameter needed. (Use Colebrook eq.)

$K_{ent} = 0.5$, $K_{elbow} = 0.2$, $K_{exit} = 1$

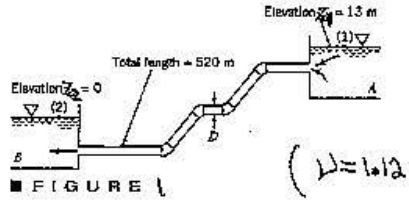

FIGURE 1

(30%)

($\mu = 1.12 \times 10^{-6}\ \frac{m^2}{s}$)

Colebrook eq.

$$\frac{1}{\sqrt{f}} = -2.0 \log\left[\frac{\varepsilon/D}{3.7} + \frac{2.51}{Re\sqrt{f}}\right]$$

103005