科目：**普通流體力學**   適用系所：**海洋環境科技研究所**

注意：1.本試題共1頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則依規定扣分。

1. 請說明下列流力常數之物理意義 (20 分)
   (1) Reynolds number
   (2) Rossby number
   (3) Richardson number
   (4) Froude number

2. 解釋名詞 (20 分)
   (1) Boussinesq approximation
   (2) ideal flow
   (3) vorticity
   (4) Newtonian fluids

3. Please write down the "**Euler's equation**" and describe its physical meaning. (10 分)

4. For a **laminar flow**, the velocity distribution in a pipe is a parabolic pattern (as shown in following figure). Please draw the velocity distribution of a **turbulent flow** in a pipe and explain why the flow pattern is different. (10 分)
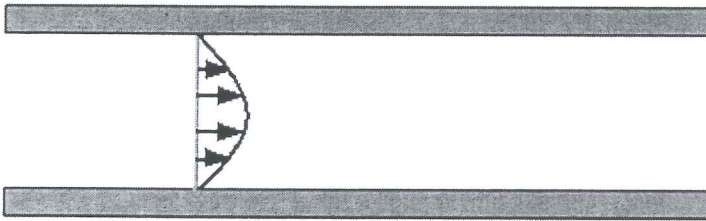
5. Write down the **Navier-Stokes equations** for incompressible Newtonian viscous fluid in vector form and discuss the meaning of each term in the equations. (20 分)

6. Please derive the **continuity equation**, $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0$, for a three-dimensional, steady incompressible flow with the ideal of "**mass conservation of a control volume**". (20 分)