臺灣綜合大學系統113學年度學士班轉學生聯合招生考試試題

科目名稱	流體力學	類組代碼	D36
		科目碼	D3692

※本項考試依簡章規定所有考科均「不可」使用計算機。　　本科試題共計 1 頁

1. (20%) 是非題 (請以o或×作答)
   (a) (5%) For steady flows, tangential accelerations may exit if the streamlines are curved.
   (b) (5%) The unit of specific weight is dimensionless.
   (c) (5%) If a flow is steady, its parameter values (velocity, density, temperature, etc.) at any location will be invariant with time.
   (d) (5%) The viscosity of water increases as the temperature decreases.

2. (16%) Please list the conditions when the methods of (a) stream function (8%), and (b) velocity potential are applicable (8%), respectively.

3. (24%) Let the shear stress τ of a fluid be given by $\tau = \mu \frac{du}{dz}$ with μ the dynamic viscosity, u the velocity, and $\frac{du}{dz}$ the velocity gradient.
   (a) (8%) What is the unit of the shear stress τ in SI system?
   (b) (8%) What is the unit of the dynamic viscosity μ in SI system?
   (c) (8%) What is the unit of the associated kinematic viscosity in SI system?

4. (40%) As shown in the figure, a horizontal circular pipe with a steady, incompressible and fully developed laminar flow, where the viscosity of the fluid is μ.
   (a) (10%) Please determine the pressure difference Δp for a section length L (expressed by the length L, diameter D and wall shear stress τ_w)
   (b) (10%) Letting R be the radius of the pipe, please express the velocity profile $v(r)$ by L, D, r, Δp and μ, for $0 \le r \le R$. (PS please use the no-slip boundary condition on the pipe wall)
   (c) (10%) Please show that the average velocity $V = \frac{\Delta p D^2}{32 \mu L}$.
   (d) (10%) With the help of (c), please show that the head loss is $h_L = f \frac{V^2}{2g} \frac{L}{D}$ with $f = \frac{64}{\mathrm{Re}}$.