淡江大學 105 學年度日間部轉學生招生考試試題

系別：航空太空工程學系三年級　　科目：流體力學　　47-1

考試日期：7 月 22 日(星期五) 第 3 節　　本試題共 6 大題，1 頁

1. In fluid dynamics, what is "differential approach"? What kind of equations is obtained? (10%)

2. In system of dimensions, what is "MLtT" system? Express the units of "shear stress" and "power" in terms of MLtT system. (10%)

3. Draw qualitative pictures of incompressible inviscid and viscous flows over a cylinder. Explain what causes the difference between these two flows. (20%)

4. What is streamline? A velocity field is specified as $\vec{V} = ax\vec{i} - ay\vec{j}$. Why is the flow two-dimensional? Develop an equation for the streamline. (20%)

5. Air flows steadily and at low speed through a horizontal nozzle, discharging to the atmosphere. At the nozzle inlet, the area is 0.1 m^2. At the nozzle exit, the area is 0.02 m^2. The flow is essentially incompressible and frictional effects are negligible. Determine the gage pressure required at the nozzle inlet to produce an outlet speed of 50 m/s. (Note: solving the problem by continuity and Bernoulli equations) (20%)

6. The drag force, F, on a smooth sphere depends on the relative velocity, V, the sphere diameter, D, the fluid density, ρ, and the fluid viscosity, μ, Obtain a set of dimensionless groups that can be used to correlate the experimental data (dimensional analysis). Explain the result. (20%)