淡江大學106學年度碩士班招生考試試題 41-1

系别:航空太空工程學系A組 科目:流體力學

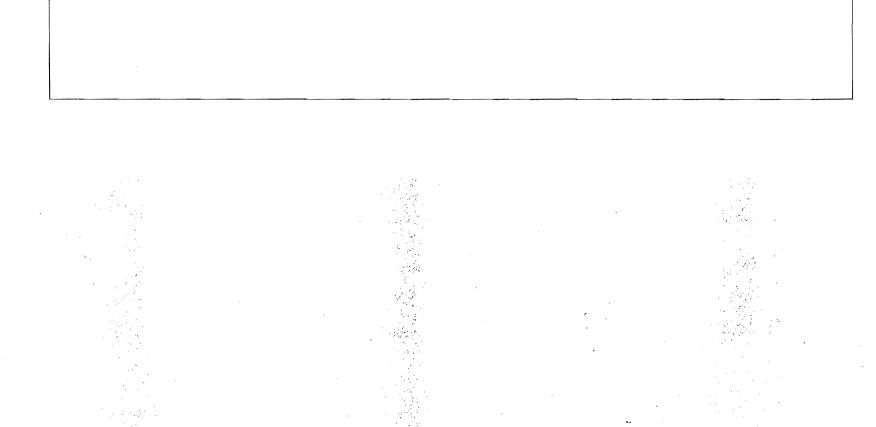
考試日期:3月4日(星期六)第2節 本試題共 8 大題, 1 頁

簡答題

- 1. 何謂流體靜力學(fluid statics)?何謂流體動力學(fluid dynamics)?寫出探討流體力 學常用的三定律。(10分)
- 流體力學中,介紹 "stream function"與 "velocity potential" 主要目的為何? 寫 出流場速度與 velocity potential 的關聯。如何由 stream function 獲得流場的流線? (10分)
- 3. 何謂黏滯流(viscous flow)? 說明流體流經物體表面時,因黏滯性所造成的流場特 性。(10分)
- 4. 說明因次分析(dimensional analysis)在實驗流體力學的重要性。什麼是"incomplete similitude"? (10分)
- 5. 在管流(pipe flow) 中, 什麼是 "entrance region"、"fully developed region"、"major loss" 與 "minor loss"? (15 分)

計算題

- 6. An airplane moves forward at a speed of 971 km/hr. The frontal intake area of the jet engine is 0.8 m^2 and the entering air density is 0.736 kg/m^3 . A stationary observer determines that relative to the earth, the jet engine exhaust gases move away from the engine with a speed of 1050 km/hr. The engine exhaust area is 0.588 m^2 and the exhaust gas density is 0.515 kg/m^3 . Estimate the mass flow rate of fuel into the engine in kg/hr. (Note: applying the integral continuity equation to solve the problem) (15 $\frac{1}{27}$)
- 7. For a flow in the xy plane, the y component of velocity is given by $v=y^2-2x+2y$. Determine a possible x component for steady, incompressible flow. Is it also valid for unsteady, incompressible flow? Why? (Note: applying the differential continuity equation to solve this problem) (15 $\frac{1}{2}$)
- 8. Air flows steadily and at low speed through a horizontal nozzle, discharging to the atmosphere (density is 1.23 kg/m³). At the nozzle inlet, the area is 0.1 m². At the nozzle exit, the area is 0.02 m². 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: applying the Bernoulli equation to solve the problem) (15 $\frac{1}{2}$)



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