

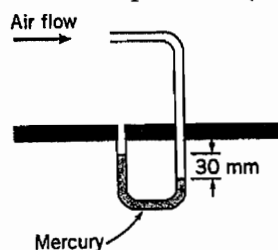
逢甲大學100學年度碩士班招生考試試題 編號：004 科目代碼：303

科目	熱流學(含熱力學、流體力學)	適用系所	機械與電腦輔助工程學系機械工程碩士班熱流組	時間	120 分鐘
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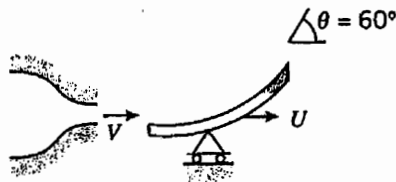
※請務必在答案卷作答區內作答。

共 2 頁 第 1 頁

- 定義或說明(盡量以簡圖或式子表示)下面各項:(佔 30 分)
 - 發電機效率(generator efficiency)
 - 露點溫度(dew-point temperature)
 - 克勞修斯不等式(Clausius inequality)
 - 熵增原理(increase of entropy principle)
 - 史特靈循環(Stirling cycle)
- 一剛性容器裝有熱流體,因翼輪的攪拌而被冷卻。最初流體的內能為 900 kJ,在冷卻過程中流體損失 300 kJ 的熱,而翼輪作 200 kJ 的功於流體。試求流體最後的內能。不計儲存於翼輪的能量。
 - 某一地方的風速穩定為 12 m/s。試求每單位質量空氣的機械能量和葉片直徑 50 m 的風力發電機產生電力的能力。假定總效率為 30%,空氣密度是 1.25 kg/m³,試求實際產生的電力。(佔 30 分)
- 熱從爐子以 90MW 的速率傳至一熱機,若排至附近河流的廢熱為 40 MW,試求此熱機的淨功率輸出與熱效率。
 - 熱機從 1400K 的熱源獲得 700kJ/s 的熱,並將廢熱傳至 350K 的環境中。此熱機的輸出功為 150kW。試求出此過程的可逆功(reversible work)和不可逆性(irreversibility)。(佔 20 分)
- 空氣在 200 kPa 與 950 K 以低速進入一絕熱噴嘴而在 80 kPa 的壓力排出。若噴嘴的等熵效率(adiabatic efficiency)為 92%。試求最大可能的出口速度和出口溫度,以及空氣實際的出口速度。假設定壓比熱 $C_p=1.099\text{kJ/kg}\cdot\text{K}$,比熱比為 $k=1.354$ 。(佔 20 分)
- Consider the flow field given by $\phi = a x^2 - a y^2$, where $a = 3\text{s}^{-1}$, Show that the flow is irrotational. Determine the velocity potential for this flow. (25 分)
- A pitot tube is insert in an air flow to measure the flow speed. The tube is inserted so that it point upstream into the flow and the pressure sensed by the tube is the stagnation pressure. The static pressure is measured at the same location in the flow, using a wall pressure tap. If the pressure difference is 30 mm of mercury, determine the flow speed. ($S_{\text{Hg}} = 13.6$) (25 分)



7. A vane with a turning angle of 60° and moves at constant speed, $U=10$ m/s as shown in the figure. It receives a jet of water that leaves a stationary nozzle with speed $V=30$ m/s. The nozzle has an exit area of 0.003 m². Determine the force components that act on the van. (25 分)



8. The velocity distribution for the flow of Newtonian fluid between two wide, parallel plates is given by the equation

$$u(y) = \frac{3V}{2} \left[1 - \left(\frac{y}{h} \right)^2 \right] \quad \text{where } V \text{ is the mean velocity and the distance between two}$$

plates is $2h$.

- The fluid has a viscosity of 0.4 N-s/m². When $V = 10$ m/s and $h = 5$ m. Determine :
- (a) the shearing stress acting on the bottom wall.
- (b) the shearing stress acting on a plane parallel to the walls and passing through the centerline (midplane). (25 分)