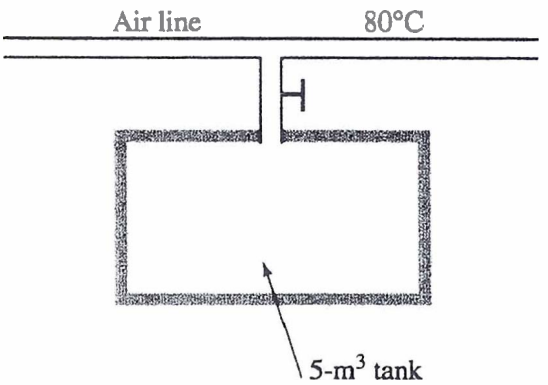
國　立　清　華　大　學　命　題　紙

95 學年度 動力機械工程學 系（所） 甲 組碩士班入學考試

科目 熱流學(一) 科目代碼 1502 共 2 頁第 1 頁 *請在【答案卷卡】內作答

QUESTION 1: 20%

An air line carries air at 800 kPa and 80°C. An insulated tank initially contains 20°C air at a pressure of 90kPa. The valve is opened, and air flows into the tank. Determine the final temperature of the air in the tank and the mass of air that enters the tank if the valve is left open. Assume that air is an ideal gas with R=0.287 kJ/(kg.K) and Cp=1 kJ/(kg.K), Cv=0.717 kJ/(kg.K).



QUESTION 2: 15%

Consider two thermal energy reservoirs at temperature T_H and T_L with heat Q_H flowing from T_H reservoir directly to T_L reservoir. Please show the relationship between the total entropy variation Δs of the two reservoirs and w, where w is the work generated by the Carnot power cycle operating between thermal energy reservoirs T_H and T_L with Q_H flowing out of T_H reservoir to the Carnot engine.

QUESTION 3: 15%

(a) Is it possible to have a 100% efficiency thermal cycle? If yes, how? If not, why? (5%)

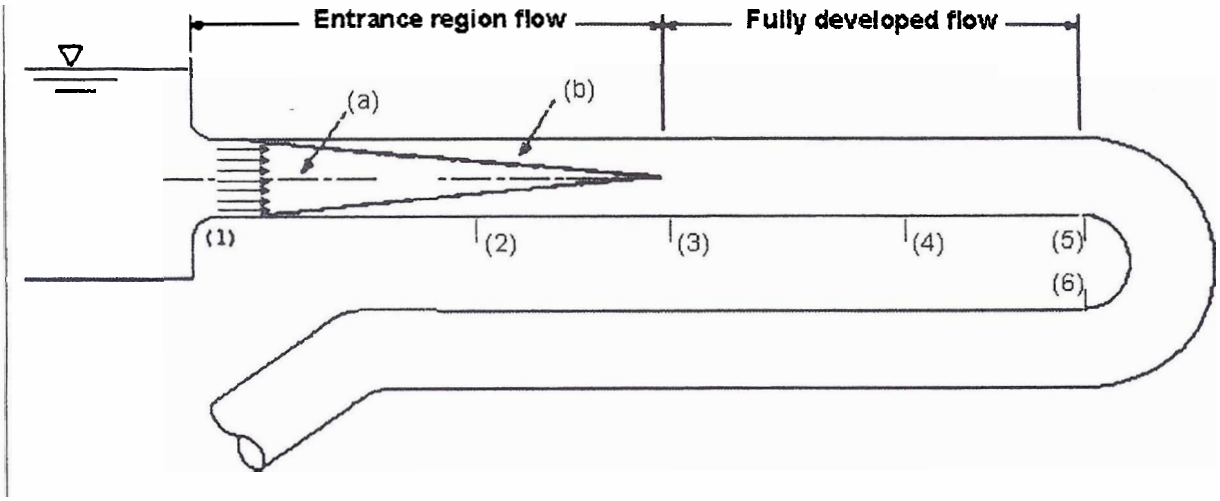
(b) Somebody claims that the efficiency of the fuel cell is over 100%, do you think it is true? If yes, how? If not, why? Why the theoretical efficiency of the fuel cell engine is always higher than that of the internal combustion engine? Please explain it from thermodynamics. (10%)

QUESTION 4: 20%

The wet bulb and dry bulb temperatures of a moist-air mixture at a total pressure of P are measured by a sling psychrometer (乾濕球濕度計) and are found to be T_w and T_d, respectively. Please explain how to determine the humidity ratio and relative humidity from the above measurements. (15%) This is the simplest way to measure the humidity of the atmosphere, are there other ways to measure the instantaneous humidity of a moist-air flow? Please give examples and explain. (5%)

QUESTION 5: 15%

Please draw the velocity profiles at the stations（2）、(3)、(4)、(5)and(6)labeled on the following figure. Also give the names of the two characteristic regions (a) and（b）.



QUESTION 6: 15%

In the figure given below the cross-sectional area of the orifice is A_o, velocity coefficient is $C_v = 0.8$, A_p is equal to $2A_o$, and contraction coefficient is 1. The other losses are assumed to be negligible. Please find the velocity V_p at the exit.