淡江大學九十學年度碩士班招生考試試題

系別：機械工程學系　　科目：熱　力　學（含熱傳導）

准帶項目請打「○」否則打「x」	
計算機	字典
○	x

本試題共 2 頁

本試題雙面印製

1. Try to explain the following thermodynamic terms: (15%)
   (1) internal energy
   (2) thermal efficiency
   (3) enthalpy
   (4) back work ratio
   (5) specific flow exergy

2. Using temperature-entropy diagram to explain the following thermodynamic cycle: (15%)
   (1) Air-standard Diesel cycle
   (2) Ericsson cycle
   (3) Stirling cycle
   (4) Air-standard ideal Brayton cycle
   (5) Air-standard dual cycle

3. Consider as the system an automobile engine. List the irreversibilities present during operation. (15%)

4. Answer the following true or false. If false, explain why. (15%)
   (a) A process that violates the second law of thermodynamics violates the first law of thermodynamics.
   (b) When a net amount of work is done by a closed system undergoing an internally reversible process, a net heat transfer of energy to the system also occurs.
   (c) One corollary of the second law of thermodynamics states that the change in entropy of a closed system must be greater than zero or equal to zero.
   (d) A closed system can experience an increase in entropy only when there is energy transfer by heat to the system during the process.
   (e) Entropy is produced in every internally reversible process of a closed system.

◀注意背面尚有試題▶

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5. A power cycle operating between two reservoirs receives energy Q_H by heat transfer from a hot reservoir at T_H=2000K and rejects energy Q_C by heat transfer to a cold reservoir at T_C=400K. For each of the following cases determine whether the cycle operates reversibly, irreversibly, or is impossible:

(20%)

(a) Q_H=1100kJ , W_{cycle}=900kJ
(b) Q_H=1000kJ , Q_C=200kJ
(c) W_{cycle}=1400kJ , Q_C=600kJ
(d) η =50%

6. During steady-state operation, a parallel-shaft gearbox receives 600kW through the high-speed shaft, but owing to friction and other irreversibilities, delivers 588kW through the low-speed shaft. The gearbox is cooled on its outer surface according to

$$\dot{Q} = -hA(T_b - T_0)$$

where h is the *heat transfer coefficient*, A is the outer surface area, T_b is the uniform temperature of the outer surface, and T_0 is the uniform temperature of the surroundings away from the immediate vicinity of the gearbox. Evaluate the rate of entropy production $\dot{\sigma}$, in kW/K, for (a)the gearbox as the system and (b)an enlarged system consisting of the gearbox and enough of its surroundings that heat transfer occurs at temperature T_0 . Let h=0.17 kW/m^2·K , A=1.8m^2 , and T_0=300K.

(20%)