淡江大學九十學年度日間部轉學生招生考試試題

系別：機械工程學系三年級

科目：熱　力　學

准帶項目請打「○」否則打「×」	
計算機	字典
○	×

本試題共 2 頁

本試題雙面印製

1. Try to explain the following thermodynamic laws:
   (1) the zeroth law of thermodynamics ,
   (2) the first law of thermodynamics ,
   (3) the second law of thermodynamics .

(15%)

2. Try to explain the following thermodynamic processes:
   (1) reversible process ,
   (2) irreversible process ,
   (3) internally reversible process ,
   (4) isobaric process ,
   (5) adiabatic process .

(15%)

3. Using temperature-entropy diagram to explain the following thermodynamic cycles:
   (1) Carnot power cycle ,
   (2) ideal Rankine cycle ,
   (3) ideal reheat vapor power cycle ,
   (4) air standard Otto cycle ,
   (5) air standard Diesel cycle .

(15%)

4. Answer the following true or false . If false , explain why .
   (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 ecery internally reversible process of a closed system .

(15%)

◀注意背面尚有試題▶

淡江大學九十學年度日間部轉學生招生考試試題

系別：機械工程學系三年級

科目：熱　力　學

准帶項目請打「○」否則打「×」	
計算機	字典
○	×

本試題共 2 頁

5. A closed system undergoes a thermodynamic cycle consisting of the following processes :

Process 1-2 : adiabatic compression with $pV^{1.4}$=constant from p_1=50 lbf/in^2 , V_1=3 ft^3 to V_2=1 ft^3

Process 2-3 : constant volume

Process 3-1 : constant pressure , U_1-U_3=46.7 Btu

There are no significant changes in kinetic or potential energy .

(a) sketch the cycle on a p-V diagram .

(b) calculate the net work for the cycle , in Btu .

(c) calculate the heat transfer for process 2-3 , in Btu .

(20%)

6. An electric motor operating at steady state draws a current of 10 amp with a voltage of 220V . The output shaft rotates at 1000RPM with a torque of 16 N·m applied to an external load . The rate of heat transfer from the motor to its surroundings is related to the surface temperature T_b and the ambient temperature T_0 by $hA(T_b-T_0)$, where h=100 W /m^2·K , A=0.195 m^2 , and T_0=293 K . Energy transfers are considered positive in the directions indicated by the arrows as shown.

(a) Determine the temperature T_b , in K .

(b) For the motor as the system , determine the rate of entropy production , in kW/K.

(c) If the system boundary is located to take in enough of the nearby surroundings for heat transfer to take place at temperature T_0 , determine the rate of entropy production , in kW/K , for the enlarged system .

(20%)