

國立成功大學  
110學年度碩士班招生考試試題

編 號：152

系 所：生物醫學工程學系

科 目：熱力學

日 期：0202

節 次：第 1 節

備 註：可使用計算機

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第1頁，共1頁

※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Please describe the followings (20 pts)
  - (1) The difference between the open and closed systems. (2 pts)
  - (2) Thermodynamics. (4 pts)
  - (3) Boundary, surroundings, and system. (6 pts)
  - (4) Assumptions for the ideal gas. (8 pts)
2. Consider a Carnot heat engine with efficiency of  $\eta_{Carnot}$  working between reservoirs at  $T_H$  and  $T_L$ . Please derive  $\eta_{Carnot} = \eta(T)$  (15 pts)
3. Derive the relationships between the temperature, pressure, and specific volume in a closed system during an isotropic process. (15 pts)
4. A cylinder fitted with a piston has an initial volume of  $1 \text{ m}^3$  and contains air at 300 kPa 27°C. The piston is moved, compressing the air until the pressure is 1 MPa and the temperature is 200°C. During this compression process heat is transferred from the air, and the work done on the air is 50 kJ. Determine the amount of heat transfer.  $C_{v,air} = 0.717 \text{ kJ/kg} \cdot \text{K}$ ,  $R_{air} = 0.287 \text{ kJ/kg} \cdot \text{K}$  (15 pts)
5. Derive the work during the internally reversible compression process for an open system under single inlet and outlet. (Ignore the potential and kinetic energies). (20 pts)
6. Prove that  $C_p - C_v = R$  using the thermodynamic relations. (15 pts)