

國立中央大學 110 學年度碩士班考試入學試題

所別： 能源工程研究所 碩士班 不分組(一般生)

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科目： 基礎熱力學

本科考試可使用計算器，廠牌、功能不拘

*請在答案卷(卡)內作答

所有題目皆為問答題，需寫完整計算過程。請按題號順序作答，避免被漏改。若您要先做後面題目，請先在答案本預留空間。

1. (5 %) Describe an imaginary process that satisfies the first law but violates the second law of thermodynamics.
2. (4 %) (a) Find the COP of a refrigerator that removes heat from the food compartment at a rate of 5040 kJ/h per kW of power consumption. Also, find the rate of heat rejection to the kitchen.
(4 %) (b) The temperature of outside air, the kitchen and the food compartment is 35°C, 27°C and 7°C, respectively. What is the maximum COP of this refrigerator?
3. (6 %) Does a cycle for which $\oint Q > 0$ violate the Clausius inequality? Why?
4. (8 %) Write and explain the expression relates the entropy generation and exergy destruction.
5. (15 %) Describe the thermodynamic principles with its four fundamental components for the air-conditioner. List any three types of air-conditioner which is operated in different thermodynamic cycle.
6. (8 %) Explain the difference between heat pump and heat engine.
7. Sketch *schematic diagrams* and accompanying *T-s diagrams* of
(8 %) (a) a simple ideal steam Rankine cycle,
(12 %) (b) an ideal steam regenerative Rankine cycle with one open feedwater heater.
8. (15 %) Sketch *schematic diagrams* and accompanying *T-s diagrams* of a two-stage cascade refrigeration. What are the advantages of a cascade system over a single stage system?
9. (15 %) 台電大潭發電廠採用複循環發電機組，複循環發電機組有何優點？為什麼？