

八十五學年度 動力機械 系(所) 甲 組碩士班研究生入學考試

科目 熱流學(工) 科號 2502 共 2 頁第 1 頁 *請在試卷【答案卷】內作答

1. About a simple vapor-compression refrigeration cycle:
 - (a) Draw the schematic arrangement of the cycle, showing the flow direction of the refrigerant and the basic components with their associated energy transport.
 - (b) Draw the ideal refrigeration cycle respectively on a P-v and a T-s diagram.
 - (c) Write the energy conservation equation for the evaporator component when the cycle is in steady-state operation.
 - (d) Which parts of an actual refrigerator do the evaporator and the condenser in your cycle respectively correspond to?
 - (e) In an actual refrigerator, identify the sources of irreversibility and locate them in the cycle.
 - (f) A refrigerator ejects heat from a low-temperature place to a high-temperature environment. Does this violate the second law of thermodynamics? Explain. (35%)

2. Consider the steady compression processes through an axial flow compressor:
 - (a) Derive the expression for calculating the required reversible work in terms of appropriate thermodynamic properties. Neglect the changes of kinetic energy and potential energy.
 - (b) On a P-v diagram compare the magnitude of work required respectively for compressing a vapor and a liquid, both from inlet pressure P_i to exit pressure P_e .
 - (c) If the compression process is considered to be isentropic, what assumptions must be made? (15%)

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3. NAVIER-STOKES EQUATIONS IN FLUID MECHANICS (25%)

- (A) Describe the main objectives for deriving the Navier-Stokes equations of motion in detail. (5%)
- (B) Itemize the assumptions for deriving the Navier-Stokes equations. (10%)
- (C) Write down the Navier-Stokes equations of motion for a flow with constant properties in a tensor form, and then describe the physical significance of each term in the equations. (10%)

4. FUNDAMENTAL CONCEPTS IN HEAT TRANSFER (25%)

- (A) List and define the important thermophysical properties of matter (solids, liquids and gases) in heat transfer. (10%)
- (B) Describe and discuss the important dimensionless parameters influencing the following heat transfer mechanism:
 - (a) Transient Conduction Heat Transfer. (5%)
 - (b) Forced Convection Heat Transfer. (5%)
 - (c) Natural Convection Heat Transfer. (5%)