

淡江大學 101 學年度碩士班招生考試試題

60

系別：航空太空工程學系

科目：熱 力 學

考試日期：2月26日(星期日) 第4節

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簡答題：

- (一) 何謂 Thermodynamics? Thermodynamics 最重要的兩個應用領域為何? (6分)
- (二) 何謂 closed system? 何謂 flow work? 何謂 cycle? (6分)
- (三) 何謂 state postulate? 何謂 saturated liquid-vapor mixture? (6分)
- (四) 在探討 reversible steady-flow work 中，在忽略動能及位能變化下，可得到公式
$$w_{rev} = \left| \int v dP \right|$$
；由此公式可得到什麼重要結論? (6分)
- (五) 在任一熱力學過程中，entropy 變化可不可小於 0? 為什麼? (6分)
- (六) Otto cycle 及 Diesel cycle 有何不同? 為何柴油引擎不需要火星塞? (6分)
- (七) 在購買冰箱或冷氣時，應選購較大或較小 EER (或 COP)? 為什麼? (6分)

計算題：

- (八) Air at 100 kPa and 280 K is compressed steadily to 600 kPa and 400 K. The mass flow rate of the air is 0.05 kg/s, and a heat loss of 16 kJ/kg occurs during the process. Assuming the changes in kinetic and potential energies are negligible, determine the necessary power input to the compressor. Note: assuming constant $C_p=1.0$ KJ/KgK. (12分)
- (九) An ideal Diesel cycle with air as the working fluid has a compression ratio of 18 and a cutoff ratio of 2. At the beginning of the compression process, the working fluid is at 100 kPa, 27°C, and 1917 cm³. Utilizing the cold-air-standard assumptions, determine (a) the temperature and pressure of air at the end of each process, (b) the net work output and the thermal efficiency. (30分)
Notes: $C_p=1.0$ KJ/KgK, $k=C_p/C_v=1.4$, $R=0.287$ KJ/KgK for air; isentropic relations:
$$T_2/T_1 = (v_1/v_2)^{k-1}, P_2/P_1 = (v_1/v_2)^k$$
- (十) A refrigerator uses refrigerant-134a as the working fluid and operates on an ideal vapor-compression refrigeration cycle between 0.14 and 0.8 MPa. If the mass flow rate of the refrigerant is 0.1 kg/s, determine (a) the rate of heat removal from the refrigerated space and the power input to the compressor, (b) the rate of heat rejection to the environment, (c) the COP of the refrigerator. (16分)
Notes: state 1: $h_1=239.16$ kJ/kg, state 2: $h_2=275.39$ kJ/kg, state 3: $h_3=95.47$ kJ/kg