國立成功大學

115學年度碩士班招生考試試題

編　號：99、115

系　所：航空太空工程學系
能源工程國際碩士學位學程

科　目：熱力學

日　期：0203

節　次：第 1 節

注　意：1.不可使用計算機
2.請於答案卷(卡)作答，於試題上作答，不予計分。

1. Consider an ideal Stirling-cycle engine in which the state at the beginning of the isothermal compression process is 100 kPa, 25°C, the compression ratio is 6, and the maximum temperature in the cycle is 1100°C. Calculate the thermal efficiency of the cycle with regenerators. (25%)

2. Evaluate the isothermal changes in internal energy, enthalpy, and entropy for an ideal gas (25%)

3. An ideal gas is contained in a piston–cylinder device and undergoes a quasi-equilibrium polytropic process described by

$$PV^n = constant$$

Derive the general expression for the work done by the system during this process.(20%)
For the same initial and final states, compare the magnitude of work done by the gas for the following processes, and explain the physical reasons:
Constant-pressure process (5%)
Constant-volume process (5%)

4. A high-pressure gas tank on an aerospace vehicle is initially sealed. The tank is then depressurized by opening a valve, allowing gas to escape. Answer the following:
(a) Should the tank be modeled as a closed system (control mass) or an open system (control volume)? Briefly explain.(5%)
During the depressurization process:
(b) What is the sign of heat transfer (5%)
(c) Does boundary work occur? Why or why not? (5%)
(d) Does the internal energy of the gas inside the tank increase, decrease, or remain constant? (5%)