

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

1. Please illustrate the advantages and constrains of making the assumption of ideal gas behaviors for gases making up the system to analyze. (20%)
2. By using examples, please illustrate the application and meaning of (a) thermal efficiency, (b) isentropic efficiency, (c) second law efficiency, and (d) coefficient of performance. (30%)
3. Plot the P - v and T - s diagrams of the following ideal gas power cycles:
 - (a) Otto cycle (5%)
 - (b) Brayton cycle (5%)
 - (c) Stirling cycle (5%)

4. The P - v - T relation for a real gas is represented by

$$P(v-a)=RT$$

where R is the gas constant and a is a constant. Determine expressions for the property changes, Δu , Δh , and Δs , for this gas. (15%)

5. (1) Show that $C_p = T \left(\frac{\partial P}{\partial T} \right)_s \left(\frac{\partial v}{\partial T} \right)_P$. (10%)

- (2) Using the Maxwell relations and the ideal-gas equation of state, determine a relation for $\left(\frac{\partial s}{\partial v} \right)_T$ for an ideal gas. (10%)