# 淡江大學九十三學年度碩士班招生考試試題

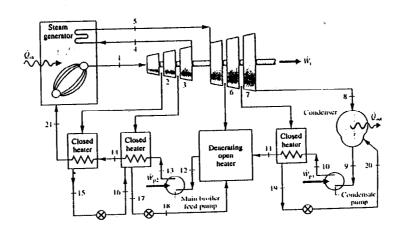系別：機械與機電工程學系　　　科目：熱　力　學

| 准帶項目請打「○」否則打「×」 |
| --- |
| 簡單型計算機 |
| ○ |

1. Give the definitions of the following thermodynamic terms by simple mathematical formula or equations, (用數學式表達定義)　(15%)
   (a) Thermodymic property as a point function
   (b) Entropy
   (c) Clausius Inequality
   (d) bwr of a steam power plant
   (e) Gibbs energy function

2. Give the conditions of Isentropic process and explain when does "entropy production" occure?(10%)

3. Give the ideal gas model and show that its enthalpy is function of temperature only. ( h=h(T)).(8%)

4. Steam go through an adiabatic nozzle, the inlet conditions are: mass flow rate 2 kg/s.Pressure 40bar, temperature 400 C, enthalpy 3213.6kJ/kg,velocity 10m/s. The out let conditions are: pressure 15 bar, specific volume 0.1627 $m^3$ /kg, velocity 665m/s. Determine (a) enthalpy at outlet, (b) area of the nozzle at outlet.(neglect potential energy change).　　(10%)

5. For air-standard ideal power cycles, draw the T-S diagram for (a) Otto cycle, (b) Brayton cycle, (c) what are the thermal efficiencies of both cycles in terms of the compression ratio, $r_o$ for Otto, $r_b$ for Brayton)(直接給答) (20%)

6. The layout of a steam power plant is shown as figure. If the following data are known; $p_1, p_2, p_3, p_4, p_5, p_6, p_7, p_8, h_{15}, h_{17}, h_{19}$. Determines $p_9, p_{10}, p_{11}, p_{12}, \ldots p_{21}, h_{16}, h_{18}, h_{20}$.(in terms of known data)　　16%

7. A refrigeration system working between $T_L$=273 K and $T_H$=299K. Determines the maximum coefficient of performance. (7%)

8. P,T,v,u,s,h are thermodynamic properties, Show that

$$T = \left(\frac{\partial u}{\partial s}\right)_v = \left(\frac{\partial h}{\partial s}\right)_p \qquad (14\%)$$

(hint:employ Tds equations and the exactness of the property as a point function)