

淡江大學九十一學年度日間部轉學生招生考試試題

系別：機電工程學系三年級

科目：熱力學

准帶項目請打「○」否則打「×」
計算機
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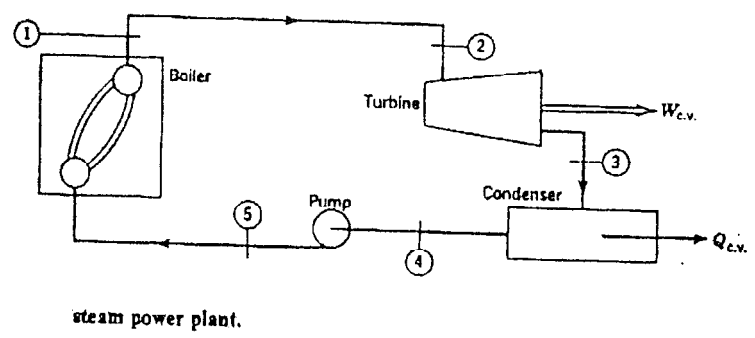
本試題雙面印製

1. Please give definitions of the following: (30%)

- (1) Adiabatic process
- (2) Coefficient of performance
- (3) Clapeyron equation
- (4) Critical point
- (5) Principle of increase of entropy
- (6) Throttling process
- (7) Ideal gas equation of state
- (8) Isobaric process
- (9) Polytropic process
- (10) Second law of thermodynamics

2. Consider the simple steam power plant, as shown in Figure. $h_1 = 3023.5 \text{ kJ/kg}$, $h_2 = 3002.5 \text{ kJ/kg}$, $h_3 = 2361.8 \text{ kJ/kg}$, $h_4 = 188.5 \text{ kJ/kg}$, Pump work = 4 kJ/kg . Determine the following quantities per kilogram flowing through the unit. (20%)

- (1) Heat transfer in line between boiler and turbine.
- (2) Turbine work.
- (3) Heat transfer in condenser.
- (4) Heat transfer in boiler.



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3. Calculate the absolute pressure for a system, given a gauge pressure of 1.5 Mpa and a barometric pressure (atmospheric pressure) of 104 kpa. (10%)

4. Nitrogen is compressed in a reversible process in a cylinder from 100 kPa, 20°C, to 500 kPa. During the compression process the relation between pressure and volume is $PV^{1.3} = \text{constant}$. Calculate the work and heat transfer per kilogram, and show this process on P-v and T-s diagrams. ($R = 0.2968 \text{ kJ/ kg K}$) (15%)

5. Please plot and explain the P-v and T-s diagram for the air –standard Otto cycle. (10%)

6. Temperature inside a Carnot refrigerator is maintained at 5°C by rejecting heat to the surroundings at an ambient temperature of 27°C. The inside temperature is now decreased to -13°C, the ambient temperature remaining constant at 27°C. Determine the percent increase in work input for the same quantity of heat Q_L removed. (15%) Hint: calculate $\frac{W_2 - W_1}{W_1} \times 100$