淡江大學 95 學年度轉學生招生考試試題

48-1

系別：機械與機電工程學系三年級　科目：熱　力　學

准帶項目請打「V」	
V	簡單型計算機

本試題共 2 頁

1. Write out the meaning of the following terms: (15%)
(1) Closed system
(2) steady state
(3) intensive property
(4) reversible process
(5) irreversible process

2. Explain the following laws: (15%)
(1) the zeroth law of thermodynamics
(2) the first law of thermodynamics
(3) the second law of thermodynamics

3. What are the relationships between thermal efficiency and compression ratio of the cold air-standard Otto and Diesel cycles? With the same compression ratio, which one has larger thermal efficiency? (15%)

4. What are the four basic relations of thermodynamic properties? Try to obtain the four Maxwell relations. (15%)

5. A closed system undergoes a process during which there is heat transfer to the system at a constant rate of 3 kW, and the power developed by the system varies with time according to

$$\dot{w} = \begin{cases} +2.4t & 0 < t \le 1h \\ +2.4 & t > 1h \end{cases}$$

where t is in hours and $\dot{w}$ is in kW. (20%)
(a) What is the time rate of change of system energy at $t = 0.6\ h$, in kW?
(b) Determine the change in system energy after 2 h, in kJ.

本試題雙面印製

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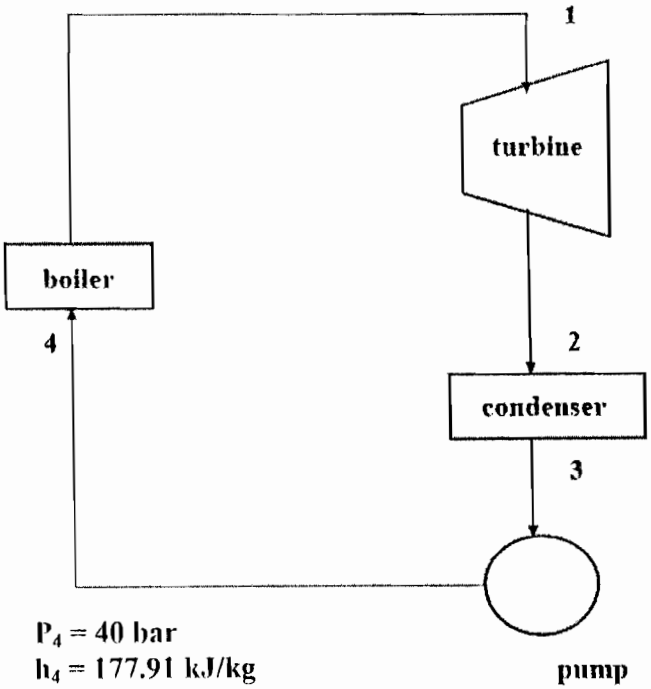
6. Water is the working fluid in an ideal Rankine cycle as shown. The net power output of the cycle is 100 MW. Determine for the cycle (20%)
   (a) the mass flow rate of water, in kg/sec
   (b) the rate of heat transfer to the working fluid passing through the boiler, in kW.
   (c) the rate of heat transfer to the working fluid passing through the condenser, in kW.
   (d) the thermal efficiency.



$P_1 = 40$ bar
$T_1 = 480\ ^\circ C$
$h_1 = 3399.2$ kJ/kg

$P_2 = 0.08$ bar
$h_2 = 2199.1$ kJ/kg

$P_3 = 0.08$ bar
$h_3 = 173.88$ kJ/kg

$P_4 = 40$ bar
$h_4 = 177.91$ kJ/kg