淡江大學 100 學年度碩士班招生考試試題

48

系別：機械與機電工程學系　　科目：熱　力　學

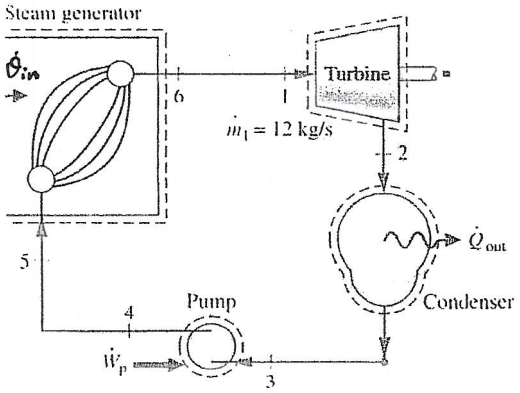
考試日期：2 月 28 日(星期一) 第 2 節　　本試題共 5 大題，　1 頁

1. From two Tds equations, Tds = du + Pdv and Tds = dh – vdP, Show that
   (a) $T = (\partial u/\partial s)_v$
   (b) $v = (\partial h/\partial P)_P$ (20%)

2. An ideal gas goes through an isentropic process from state 1 to state 2. Show that
   $T2/T1 = (P2/P1)^{\frac{k-1}{k}}$ and $T2/T1 = (v1/v2)^{k-1}$, Where k = Cp/Cv
   (hint: start with two Tds equations) (20%)

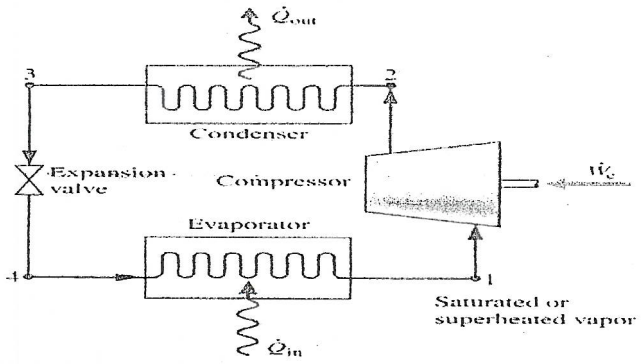
3. A mass flow rate of 2.5 kg/s of steam enters a nozzle operating at steady state With P1 = 40 bar, T1 = 400 K, h1 =3213.6 kJ/kg and a velocity of 10 m/s. The flow through the nozzle neglect the heat transfer and potential energy change. At the exit , P2 =15 bar and T2 is 280 K. h2 is 2992.5 kJ/kg. Find the exit velocity in m/s and the produced thrust in lbf (1 N = 0.2248 lbf) (20%)

4. The following figure and table provides steady state operating data for a vapor power plant .The turbine and pump operate adiabatically. Determine (a) power output in kW, (b) the thermal efficiency of this plant. (20%)



State	p	T (°C)	h (kJ/kg)
1	6 MPa	500	3422.2
2	10 kPa	- - -	1633.3
3	10 kPa	Sat.	191.83
4	7.5 MPa	- - -	199.4
5	7 MPa	40	167.57
6	6 MPa	550	3545.3

5. An ideal vapor compression refrigeration cycle is shown in the figure. R-134a is the working fluid. The flow rate is 4.8kg/min. Find the refrigeration capacity in tones and 1.0551kJ, 1 ton = 200BTU/min) (20%)



T1=0°C, h1= 247.23 kJ/kg (sat.vap.)
P2=6.853bar, h2 = 264.7 kJ/kg
T3=26°C, h3=85.75 kJ/kg,(sat.liq.)