

# 淡江大學九十二學年度轉學生招生考試試題

88

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「×」	
○	簡單型計算機

本試題共 1 頁

1. Please give definitions of: (50%)

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| (1) Adiabatic process<br>(2) Back work<br>(3) Control volume<br>(4) Dew point<br>(5) Extensive property<br>(6) First law of thermodynamics<br>(7) Gage pressure<br>(8) Heat pump<br>(9) Isentropic process<br>(10) Joule-Thomson expansion<br>(11) Kinetic energy<br>(12) Latent heat of vaporization<br>(13) Maxwell relations | (14) Nozzle efficiency<br>(15) Otto cycle<br>(16) Polytropic process<br>(17) Quasistatic process<br>(18) Regenerative cycle<br>(19) Subcooled liquid<br>(20) Stirling cycle<br>(21) Triple point<br>(22) Uniform-flow process<br>(23) Van der Waals equation<br>(24) Wet-bulb temperature<br>(25) Zeroth law of thermodynamics |
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2. Refrigerant X is throttled from a saturated liquid at 32°C to a final state where the pressure is 2 bars. Please use the attached table to determine (a) the final temperature (b) the enthalpy of saturated liquid,  $h_f$  at 32°C and (c) the quality of the fluid at the exit. (20%)

Table: Properties of saturated refrigerant X: pressure table

Pressure bar(s) P	Temp. °C T	Enthalpy kJ/kg		
		Sat. liquid $h_f$	Evap. $h_{fg}$	Sat. vapor $h_g$
2.0	-12.53	24.57	157.50	182.07
7.0	27.65	62.29	136.45	198.74
8.0	32.74	67.30	133.33	200.63

3. A totally reversible heat engine operating between fixed temperature of 900 K and 300 K produce 1000 kJ of net work output. Determine the heat input ( $Q_H$ ) and heat output ( $Q_L$ ) of the heat engine which operates as a closed system, in kilojoules. (10%)

4. For an ideal Rankine cycle for which steam leaves the boiler as saturated vapor at 30 bars and is condensed at 1.0 bar. Compute (a) the pump work;  $w_{in,pump}$  (b) the turbine work output;  $w_{T,out}$  (c) the heat input;  $q_{in}$  (d) the thermal efficiency. (e) the thermal efficiency of a Carnot cycle operating between the maximum and minimum temperatures of the Rankine cycle. ( $1 \text{ bar} = 10^5 \text{ N/m}^2$ ;  $1 \text{ m}^3 = 10^6 \text{ cm}^3$ ) (20%)

Table: Properties of saturated water: pressure table

Press. bar(s) P	Temp. °C T	Specific volume $\text{cm}^3/\text{g}$		Enthalpy kJ/kg			Entropy kJ/kg K	
		Sat. liquid $v_f$	Sat. vapor $v_g$	Sat. liquid $h_f$	Evap. $h_{fg}$	Sat. vapor $h_g$	Sat. liquid $s_f$	Sat. vapor $s_g$
1.0	99.6	1.0432	1694	417.5	2258.0	2675.5	1.3026	7.3594
30.0	233.9	1.2165	66.68	1008.4	1795.7	2804.2	2.6457	6.1869