

## 淡江大學九十學年度碩士班招生考試試題

系別：航空太空工程學系

科目：熱 力 學

准帶項目請打「○」否則打「×」	
計算機	字典
○	×

本試題共 1/2 頁

本試題雙面印製

## 壹、 簡答題：

- (一) 什麼是 “state postulate”? (6 分)
- (二) 什麼是 “closed system”? “open system”? 兩種系統之能量方程式有何不同? (6 分)
- (三) 什麼是 “heat engine”? (5 分)
- (四) 試分析在一過程中，其 entropy 之可能變化? (10 分)
- (五) 在熱力學中爲了簡化各種 cycle 之分析，常作 Air-Standard Assumption。什麼是 Air-Standard Assumption? (8 分)

## 貳、 計算題：

- (六) A student living in a 4m x 6m x 6m dormitory room turns on her 150-W fan before she leaves the room on a summer day, hoping that the room will be cooler when she comes back in the evening. Assuming all the doors and windows are tightly closed and disregarding any heat transfer through the windows and the walls, determine the temperature in the room when she comes back 10 hours later. Use specific heat values at room temperature, and assume the room to be at 100 Kpa and 15°C in the morning when she leaves. (15 分) Assume  $C_v=0.718$  (KJ/Kg·°C) for air.
- (七) A four-cylinder 4.5-L diesel engine which operates on an ideal Diesel cycle has a compression ratio of 17 and a cutoff ratio of 2.2. Air is at 27 °C and 97 Kpa at the beginning of the compression process. Using the cold-air-standard assumptions, determine how much power the engine will deliver at 1500 rpm. (25 分) The gas constant for air is  $R=0.287$  (Kpa·m<sup>3</sup>/Kg·K),  $C_p=1.005$  (KJ/Kg·K)

◀ 注意背面尚有試題 ▶

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本試題共  $\frac{2}{2}$  頁

(八) Consider a coal-fired steam power plant which produces 300 MW of electric power. The power plant operates on a simple ideal Rankine cycle with turbine inlet conditions of 5 Mpa and 450°C and a condenser pressure of 25 Kpa. The coal used has a heating value (energy released when the fuel is burned) of 29,300 KJ/Kg. Assuming that 75 percent of this energy is transferred to the steam in the boiler and that the electric generator has an efficiency of 96 percent, determine (a) the overall plant efficiency (the ratio of net electric power output to the energy input as fuel) and (b) the required rate of coal supply, in t/h [1 metric ton (t) = 1000 kg]. (25 分)

**Saturated water-Pressure table**

Press. kPa <i>P</i>	Sat. temp. °C <i>T<sub>sat</sub></i>	Specific volume m <sup>3</sup> /kg		Internal energy kJ/kg			Enthalpy kJ/kg			Entropy kJ/(kg · K)		
		Sat. liquid <i>v<sub>f</sub></i>	Sat. vapor <i>v<sub>g</sub></i>	Sat. liquid <i>u<sub>f</sub></i>	Evap. <i>u<sub>fg</sub></i>	Sat. vapor <i>u<sub>g</sub></i>	Sat. liquid <i>h<sub>f</sub></i>	Evap. <i>h<sub>fg</sub></i>	Sat. vapor <i>h<sub>g</sub></i>	Sat. liquid <i>s<sub>f</sub></i>	Evap. <i>s<sub>fg</sub></i>	Sat. vapor <i>s<sub>g</sub></i>
0.6113	0.01	0.001 000	206.14	0.00	2375.3	2375.3	0.01	2501.3	2501.4	0.0000	9.1562	9.1562
1.0	6.98	0.001 000	129.21	29.30	2355.7	2385.0	29.30	2484.9	2514.2	0.1059	8.6322	8.7381
1.5	13.03	0.001 001	87.98	54.71	2338.6	2393.3	54.71	2470.6	2525.3	0.1957	8.6322	8.8279
2.0	17.50	0.001 001	67.00	73.48	2326.0	2399.5	73.48	2460.0	2533.5	0.2607	8.4629	8.7237
2.5	21.08	0.001 002	54.25	88.48	2315.9	2404.4	88.49	2451.6	2540.0	0.3120	8.3311	8.6432
3.0	24.08	0.001 003	45.67	101.04	2307.5	2408.5	101.05	2444.5	2545.5	0.3545	8.2231	8.5776
4.0	28.96	0.001 004	34.80	121.45	2293.7	2415.2	121.46	2432.9	2554.4	0.4226	8.0520	8.4746
5.0	32.88	0.001 005	28.19	137.81	2282.7	2420.5	137.82	2423.7	2561.5	0.4764	7.9187	8.3951
7.5	40.29	0.001 008	19.24	168.78	2261.7	2430.5	168.79	2406.0	2574.8	0.5764	7.6750	8.2515
10	45.81	0.001 010	14.67	191.82	2246.1	2437.9	191.83	2392.8	2584.7	0.6493	7.5009	8.1502
15	53.97	0.001 014	10.02	225.92	2222.8	2448.7	225.94	2373.1	2599.1	0.7549	7.2536	8.0085
20	60.06	0.001 017	7.649	251.38	2205.4	2456.7	251.40	2358.3	2609.7	0.8320	7.0766	7.9085
25	64.97	0.001 020	6.204	271.90	2191.2	2463.1	271.93	2346.3	2618.2	0.8931	6.9383	7.8314
30	69.10	0.001 022	5.229	289.20	2179.2	2468.4	289.23	2336.1	2625.3	0.9439	6.8247	7.7686

**Superheated water**

<i>T</i> °C	<i>v</i> m <sup>3</sup> /kg	<i>u</i> kJ/kg	<i>h</i> kJ/kg	<i>s</i> kJ/(kg · K)	<i>P</i> = 4.0 MPa (250.40°C)				<i>P</i> = 4.5 MPa (257.49°C)				<i>P</i> = 5.0 MPa (263.99°C)			
					<i>v</i>	<i>u</i>	<i>h</i>	<i>s</i>	<i>v</i>	<i>u</i>	<i>h</i>	<i>s</i>	<i>v</i>	<i>u</i>	<i>h</i>	<i>s</i>
Sat.	0.049 78	2602.3	2801.4	6.0701	0.044 06	2600.1	2798.3	6.0198	0.039 44	2597.1	2794.3	5.9734				
275	0.054 57	2667.9	2886.2	6.2285	0.047 30	2650.3	2863.2	6.1401	0.041 41	2631.3	2838.3	6.0544				
300	0.058 84	2725.3	2960.7	6.3615	0.051 35	2712.0	2943.1	6.2828	0.045 32	2698.0	2924.5	6.2084				
350	0.066 45	2826.7	3092.5	6.5821	0.058 40	2817.8	3080.6	6.5131	0.051 94	2808.7	3068.4	6.4493				
400	0.073 41	2919.9	3213.6	6.7690	0.064 75	2913.3	3204.7	6.7047	0.057 81	2906.6	3195.7	6.6459				
450	0.080 02	3010.2	3330.3	6.9363	0.070 74	3005.0	3323.3	6.8746	0.063 30	2999.7	3316.2	6.8186				
500	0.086 43	3099.5	3445.3	7.0901	0.076 51	3095.3	3439.6	7.0301	0.068 57	3091.0	3433.8	6.9759				
600	0.098 85	3279.1	3674.4	7.3688	0.087 65	3276.0	3670.5	7.3110	0.078 69	3273.0	3666.5	7.2589				
700	0.110 95	3462.1	3905.9	7.6198	0.098 47	3459.9	3903.0	7.5631	0.088 49	3457.6	3900.1	7.5122				
800	0.122 87	3650.0	4141.5	7.8502	0.109 11	3648.3	4139.3	7.7942	0.098 11	3646.6	4137.1	7.7440				
900	0.134 69	3843.6	4382.3	8.0647	0.119 65	3842.2	4380.6	8.0091	0.107 62	3840.7	4378.8	7.9593				