

國立臺北科技大學 113 學年度碩士班招生考試

系所組別：1303 車輛工程系碩士班

第二節 熱力學 試題 (選考)

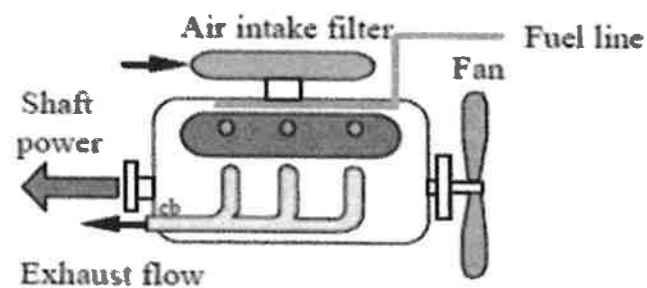
第 1 頁 共 1 頁

注意事項：

1. 本試題共 5 題，每題 20 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. A compressor receives air at 100 kPa, with a velocity of 10 m/s. At the compressor discharge, the air exits at 1000 kPa, 500 K, with a velocity of 30 m/s, and then flows into a constant-pressure aftercooler, where it is cooled down to 360 K. The power input to the compressor is 50 kW. Determine the heat transfer in the aftercooler. (20%)
(Air $C_v = 0.7176$ KJ/kg-K, $C_p = 1.004$ KJ/kg-K, $R = 0.287$ kN-m/kg-K)

2. A car engine delivers 35 hp to the drive shaft with a thermal efficiency of 40%. The fuel has a heating value of 40,000 kJ/kg. Find the rate of fuel consumption (10%) and the combines power rejected through the radiator and exhaust. (10%)



3. A piston cylinder has the water volume separated into $V_A = 0.2$ m³ and $V_B = 0.4$ m³ by a stiff membrane. The initial state in A is 1000 kPa quality $x = 0.65$ and in B it is 1600 kPa and 250°C. Now the membrane ruptures and the water comes to a uniform state with 200°C. (20%)
 - a. Find the final pressure. (5%)
 - b. Find the work in the process. (5%)
 - c. Find the final volume. (5%)
 - d. Find the heat transfer in the process. (5%)

4. A heat pump is used to heat a house during the winter. The house is to be maintained at 25°C at all times. The house is estimated to be losing heat at a rate of 145,000 kJ/h when the outside temperature drops to -10°C. Determine the minimum power required to drive this heat pump.(20%)

5. A simple steam power plant is shown in Fig. with the 4 states listed in the table below and the specific work into the pump is 4 kJ/kg. (20%)

State	Pressure	Temperature or Quality	Enthaipy,h from Table B.1
1	2.0Mpa	400°C	$h_1=3247.6$ kJ/kg
2	1.8Mpa	300°C	$h_2=3029.21$ kJ/kg
3	20kpa	90%	$h_3=251.38+0.9*2358.33=2373.877$ kJ/kg
4	14kpa	45°C	$h_4=188.4$ kJ/kg

Determine the following quantities per kilogram flowing through the unit:

- a. Heat transfer in the line between the boiler and turbine. (5%)
- b. Turbine work. (5%)
- c. Heat transfer in the condenser. (5%)
- d. Heat transfer in the boiler. (5%)

