

淡江大學九十二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「×」
簡單型計算機
○

本試題共 1/2 頁

本試題雙面印製

一、計算應用題

- (20/100) In an aircraft engine, compressed air at 3 bar and 450 K enters a *combustion chamber* in which heat is added at constant pressure to the air by the combustion of a fuel. Air is thus heated to a temperature of 1250 K. It then enters a *turbine* with a negligible velocity. It expands in the turbine until its temperature falls to 1000 K. The velocity of air leaving the turbine is 50 m/s. Air then enters a *convergent divergent nozzle* wherein it expands until its temperature drops to 800 K. Flow through both turbine and nozzle may be considered as reversible adiabatic. Determine: ($C_{p0} = 1.0035 \text{ kJ/kg} \cdot \text{K}$)
 - Heat added in the combustion chamber per kg of air.
 - Work done in the turbine per kg of air.
 - Velocity of air leaving the nozzle.
 - Pressure of air leaving the turbine, and at exit from the nozzle.
- (10/100) Consider
 - Air enters a *diffuser* at 1 bar, 60°C. It leaves at 2.8 bar with a negligible velocity. It is designed for an efficiency of 80 per cent in terms of pressures. Determine the initial velocity, and the temperature of air leaving diffuser. ($C_{p0} = 1.0035 \text{ kJ/kg} \cdot \text{K}$)
 - What would be the required initial velocity in the case of a *reversible adiabatic diffuser*?
- (20/100) A Carnot steam cycle operates between a source temperature of 311.06 °C (boiler pressure 10 MPa) and a sink temperature of 32.88 °C (condenser pressure 5 kPa). Determine the ratio of net work to turbine work and the thermal efficiency of the cycle when all processes are reversible.

Temp(°C)	Press(kPa)	h(kJ/kg)	h _g (kJ/kg)	h _f (kJ/kg)	s _f (kJ/kgK)	s _g (kJ/kgK)	s _f (kJ/kgK)
30	4.246	125.79	2430.5	2556.3	0.4369	8.0164	8.4533
35	5.628	146.68	2418.6	2565.3	0.5053	7.8478	8.3531
Temp(°C)	Press(MPa)	h(kJ/kg)	h _g (kJ/kg)	h _f (kJ/kg)	s _f (kJ/kgK)	s _g (kJ/kgK)	s _f (kJ/kgK)
310	9.856	1401.3	1326	2727.3	3.3493	2.2737	5.623
315	10.547	1431.3	1283.5	2714.5	3.3982	2.1821	5.5804

◀ 注意背面尚有試題 ▶

淡江大學九十二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「x」
簡單型計算機
○

本試題共 $\frac{3}{2}$ 頁

二、簡答題：(50/100)

- (1) . What is the significance of the area under a line on a $T-s$ plane?
- (2) . Why does a ramjet not have a turbine?
- (3) . What is an isentropic efficiency?
- (4) . How is heat different from work?
- (5) . What is entropy production? What is entropy flow with heat?
- (6) . Why do we need a "second law" of thermodynamics?
- (7) . What is the difference between a control mass and a control volume?
- (8) . What happens when a saturated liquid is heated at constant volume?
- (9) . How can we tell if a gas behaves like a perfect gas?
- (10) . Why is heat not a property?