

淡江大學八十九學年度碩士班招生考試試題

系別：機械工程學系

科目：熱力學(含熱傳導)

本試題共 / 頁

1. Please give definitions of the following: (20%)
 - (1) Isothermal process
 - (2) Rankine cycle
 - (3) Biot number
 - (4) Wet-bulb temperature
 - (5) Lumped parameter analysis
 - (6) Fourier's law of conduction
 - (7) Irreversibility
 - (8) Thermal contact resistance
 - (9) Dew point temperature
 - (10) Second law of thermodynamics

2. Under what limiting condition do all gases behave as an ideal gas? (10%)

3. Explain in terms of process lines on a PV diagram why boundary work is a path function. (10%)

4. A ball falling in a vacuum requires 1 second to reach the ground. Can adiabatic work interaction be considered during the first 0.5 sec of the ball when the ball is chosen as the system? (10%)

5. Explain how heat transfer out of a nozzle will affect the exit velocity for a given inlet state and final pressure. (10%)

6. Two large aluminum plates ($k=240 \text{ W/m K}$), each 1 cm thick, with $10\mu\text{m}$ surface roughness are placed in contact under 10^5 N/m^2 pressure in air. The contact resistance R_c is $2.75 \times 10^{-4} \text{ m}^2 \text{ K/W}$. The heat flux is $3 \times 10^4 \text{ W/m}^2 \text{ K}$. Calculate (a) the temperature difference between the outside surfaces. (10%) (b) the temperature drop due to the contact resistance. (5%)

7. Obtain an expression for the entropy change as a function of pressure and temperature. (10%)

8. An air standard Otto cycle of 48% thermal efficiency has air at 25°C and 1 bar at the beginning of the isentropic compression. Calculate the temperature and pressure of air at the end of the isentropic compression process. (15%)