

本試題是否可以使用計算機:  可使用,  不可使用 (請命題老師勾選)

**Problem 1 (15%)**

A man is cooking mutton for his family in a span which is (a) uncovered (b) covered with a light lid (c) covered with a heavy lid. For which case will the cooking time be the shortest? why?

**Problem 2 (15%)**

A household refrigerator sits in a closed room (This room can be treated as thermally insulated). A 220 Volt power which pass through the wall is connected to this refrigerator. Will the average temperature of the air in the room remain constant, increase, or decreased when the door of refrigerator (1) closed (2) open?

**Problem 3 (20%)**

An insulated, rigid tank contains 4 Kg of air at 450 KPa and 30 °C. A valve is now opened and air is allowed to escape until the pressure inside drops to 150KPa. Assuming that the air inside the tank has undergone a reversible, adiabatic process, please determine the final mass and the final temperature in the tank. Assume: air is an ideal gas.

**Problem 4 (25%)**

In a air-standard Brayton cycle the air enters the compressor at 0.1 MPa, 15 °C. The pressure leaving the compressor is 1.0 MPa, and the maximum temperature in the cycle is 1100 °C. Determine: (a) The pressure and temperature at each point in the cycle. (b) The compressor work, turbine work and cycle efficiency.

**Problem 5 (25%)**

Prove Joule-Thomson  $\mu_f = \frac{T^2}{C_p} \left[ \frac{\partial(v/T)}{\partial T} \right]_p$ , by using  $h=h(T, P)$ ;  $Tds=dh-vdP$ ;

$$\left( \frac{\partial v}{\partial T} \right)_p = - \left( \frac{\partial s}{\partial P} \right)_T$$