:

(50%)         ,        1O

1.                      closed system     open system.

2.Sketch the phase diagram for water used to discuss the structure of the superheated vapor and compressed liquid tables(not to scale).

3.what is the Clausius statement ofthe second law?

4.Sketch p-v diagram for a Camot vapor power cycle.

5.    TdS=dU+PdV         TdS=dH-VdP

熱傳考題

1. (10%) A closed contained filled with hot coffee is in a room whose air and walls are at a fixed temperature. Identify all heat transfer processes that contribute to cooling of the coffee. Comment on feature that would contribute to a superior container design.

*Schematic:*
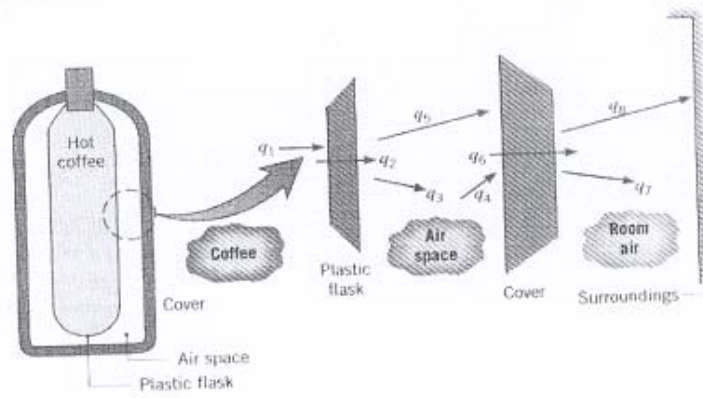


2. (15%) For flow of a liquid metal through a circular tube, the velocity and temperature profiles at a particular axial location may be approximated as being uniform and parabolic, respectively. That is, $u(r)=C_1$, and $T(r)-T_S=C_2[1-(r/r_0)^2]$, where $C_1$ and $C_2$ are constants. What is the value of the Nusselt number $Nu_D$ at this location?

*Schematic:*



$$T(r) - T_s = C_2[1 - (\tfrac{r}{r_a})^2]$$
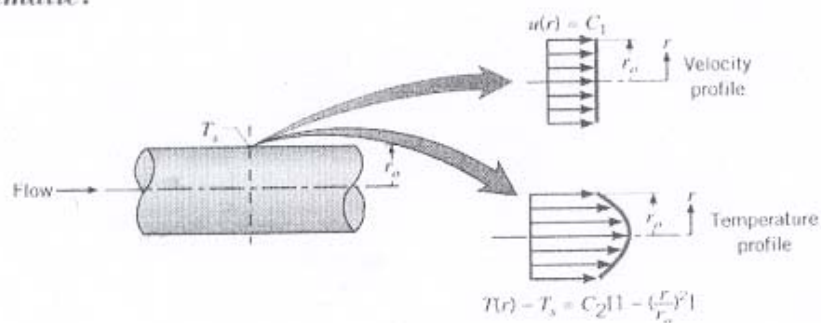
3. (25%) Consider two long vertical plates maintained at uniform temperature $T_{S,1} >$ $T_{S,2}$, The plates are open at their ends and are separated by the distance 2L.
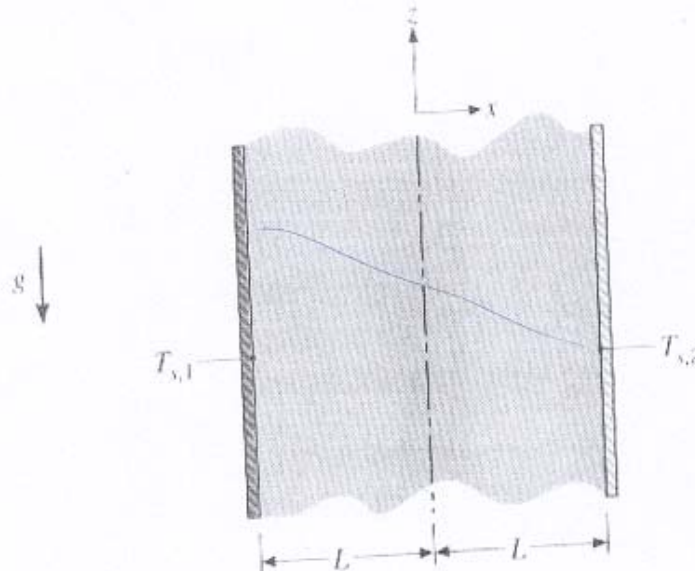


(a). Sketch the velocity distribution in the space between the plates.

(b). Write appropriate forms of the continuity, momentum, and energy equations for laminar flow between the plates.

(c). Evaluate the temperature distribution, and express your results in terms of the mean temperature, $T_m = (T_{s,1} + T_{s,2}) / 2$.

(d). Estimate the vertical pressure gradient by assuming the density to be a constant $\rho_m$ corresponding to Tm. Substituting from the Boussinesq approximation, obtain the resulting form for the momentum equation.

(e). Determine the velocity distribution.