laminar boundary layer -

velocity bd layer → ① distribution of velocity in bd layer ✓ u, v? p?

temp bd layer ② distribution of temp together with velocity of the fluid in bd layer

⇒ thermal bd layer

- Reynolds number, bd layer thickness
- Eqⁿ of continuity — mass conservation
- Eqⁿ of motion — NS Eqⁿ of motion — momentum conservation
- bd conditions

Need - Energy Equation - temperature

① derivation ✓

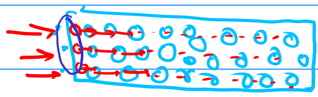
② Theory of similarity for heat transfer.

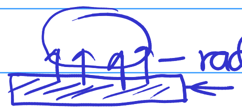
Example

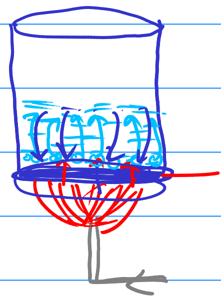
Heat transfer
- Conduction — medium - do not move = solid / fluid
- Convection — medium — move — fluid
- Radiation — no medium — × vaccum / space

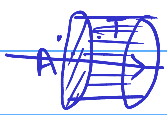
Con

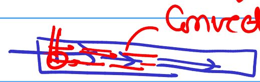
Conduction heat transfer

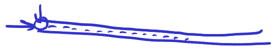












heat flux $\frac{q_x}{A} \propto \frac{\partial T}{\partial x}$

$q_x = -Ak \frac{\partial T}{\partial x}$

mass transfer
- Convection
- diffusion

Next -

Study the section 'a' and 'c' → Theory of similarity in heat transfer

↓ derivation of energy equation

↓
→ • define the five non-dimensional
→ numbers in heat transfer
→ • their physical interpretation
→ • non-dimensional form of energy equation

and section 'e'

↓ Simplification of thermal boundary layer.

section - 'f' : General properties of thermal boundary layer

section 'g' Thermal boundary layer in forced flow

(1) Parallel flow past a flat plate at zero incidence