**CONVECTION**

**CHAPTER-7 ------ EXTERNAL CONVECTION**

Term convection is used to describe the energy transfer between a surface and a moving fluid over a surface.

Convection includes energy transfer by both the bulk fluid motion and the random motion of fluid molecules.

Before we start chapter 7, we have to remember the velocity boundary layer.



: free stream velocity

=0 at x=0 (no strip boundary condition)

: boundary layer thickness

At y= =0.99

as x from the leading edge, and the effects of viscosity penetrate further into the free stream and the boundary layer grows.

To introduce the concept of a boundary layer, consider the flow over a flat plate shown above.

When fluid particles make contact with the surface, their velocity is reduced significantly relatively to the fluid velocity upstream of the plane.

It is valid to assume that the particle velocity is zero at the wall. These particles then act to retard particles in the adjoining fluid layer, which act to retard the motion of particles in the next layer.

This retardation of fluid motion is associated with shear stress, acting in planes that are parallel to the fluid velocity:

as y ………… u

designate the free stream outside the boundary layer.



Laminary boundary layer begins at the edge (x=0) and changes to turbulent layer at a location at x=xc for which critical Rec is obtained.

Similarly when Ts>, surface temperature is higher than the bulk fluid temperature (the fluid meets the colder surface).





**Summary**

**All laminar flow over the flat plate**

Properties are determined at Tf (or Tave) , Tf =(Ts+)/2

Local convection coefficient ………..

If you want to calculate an average h ……….

=

**All turbulent over the flat plate**

**Mixed flow over the flat plate**

