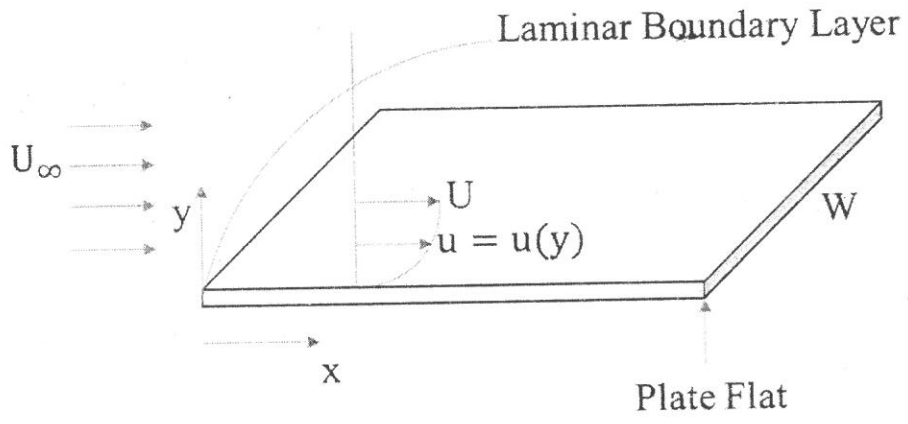
1.



For parallel flow U_∞ is the inlet flow on plate Flat plane.

(a). What's the flow on laminar Boundary layer and on turbulent Boundary layer? 10%

(b). How to define and explained the physical means of problem (a) 5%

(c). For laminar Boundary layer giving the inlet parallel flow is U_∞ and the thickness of boundary layer is δ, and the define U is $U=u(y=\delta)$. What's conditions for $U_\infty > U$、$U_\infty < U$, and $U_\infty = U$ by your explained it. 5%

(d). Derive the simplified Boundary-layer equation as

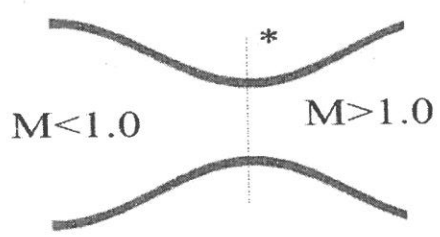
$$u\frac{\partial u}{\partial Y} + v\frac{\partial u}{\partial y} = -\frac{1}{\rho}\frac{\partial P}{\partial Y} + \nu\frac{\partial^2 u}{\partial y^2}$$

by Navier-Stokes equation or conservation of linear momentum equation. 10%

2.

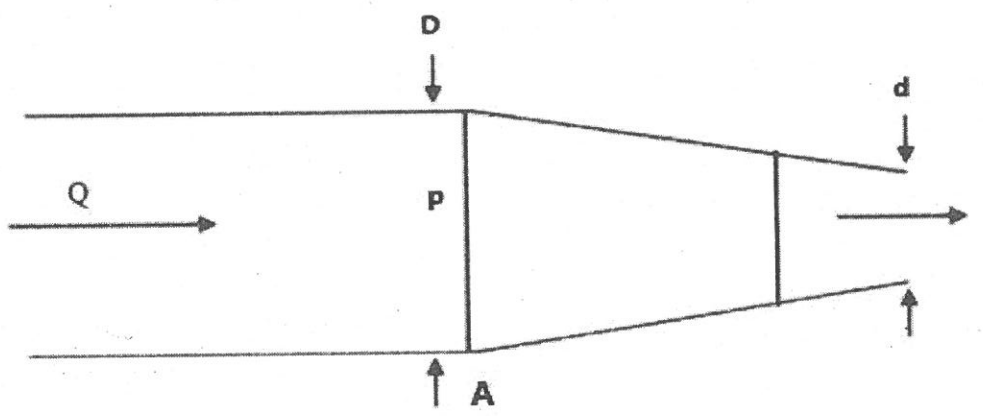
(a). What's mechanism to made up Supersonic fluid flow? Isn't Nozzle? For your explain and the show to conditions? 10%

(b). For the convergent-divergent nozzle to prove that $M^* = 1.0$ where * is throat area by $dA^* = 0$? 10%



3.

A steady flow ($Q=0.5m^3/s$) of water occurs in a horizontal nozzle, shown in the figure, which has the diameters of 20cm (D) and 5cm (d). Calculate the pressure p at the base of the nozzle (location A). 20%



4.

An incompressible flow field is described by

$$\phi = x^2 - y^2 + 2z^2$$

(a). Calculate the pressure difference between points (2,4,3) and (5,-2,6). 15%

(b). If the pressure is zero at (2,1,2), Calculate the maximum pressure in this flow field. 15%