P R E F A C E

This dissertation entitled "STUDY OF BOUNDARY LAYER PROBLEMS IN POROUS MEDIA" contains two chapters.

First chapter is introductory which deals with the brief history of boundary layer theory. In this Chapter we enlised some major developments in this theory by various research workers and also gave some basic concepts as pre-requisite for the problems to be discussed in the second chapter.

The Second Chapter covers some two dimensional boundary layer problems in porous media. Firstly in this chapter we have studied two dimensional boundary layer along a porous wall in sink flow following the formalism of Sutapa Mukherjee (1982) and obtained asymptotic solution for small and large η (where η is a similarity variable) respectively in the following form

$$\phi(\eta) = A_1\eta - \frac{(1+\lambda A_1)}{2!}\eta^2 + \frac{\lambda(1+\lambda A_1)}{3!} + \frac{2A_1^2 - \lambda^2(1+\lambda A_1)}{4!}$$

and $$\phi(\eta) = 1 + C\, e^{-k\eta}$$

$$\text{where } k = \frac{\lambda + \sqrt{\lambda^2 + 8}}{2}$$

Secondly we have studied the boundary layer along a porous wall in Howarth's flow (1938) following the work of M.R.Head (1961), Sutapa Mukherjee and R.C. Choudhary (1983)

and obtained the momentum integral equation, kinetic energy integral equation and compatibility condition respectively in the form

$$\frac{dt^*}{d\bar{x}} = \frac{2}{1-\bar{x}} \left[1 + (2 + H)t^* + \bar{v}_s\, t^{*1/2}\right]$$

$$\frac{dH_\epsilon}{d\bar{x}} = \frac{1}{(1-\bar{x})t^*} \left[2D - H_\epsilon \left\{1 + (H-1)\, t^* + \bar{v}_s\, t^{*1/2}\right\} + \bar{v}_s\, t^{*1/2}\right]$$

$$m = t^* + 1\, t^{*1/2}\, \bar{v}_s$$

Also we have studied the boundary layer flow in a converging channel with suction and obtained momentum integral equation, kinetic energy integral equation and wall compatibility condition respectively in the form

$$\frac{dt^*}{d\bar{x}} = -2\bar{x} \left[1 - (2 + H)\, \frac{t^*}{\bar{x}^2} + t^{*1/2}\, \bar{v}_s\right]$$

$$\frac{dH_\epsilon}{d\bar{x}} = -\frac{\bar{x}}{t^*} \left[2D - H_\epsilon \left\{1 - (H-1)\, \frac{1}{\bar{x}^2}\, t^* + t^{*1/2}\, \bar{v}_s\right\} + t^{*1/2}\, \bar{v}_s\right]$$

$$(K+1)\, \frac{\theta^2}{\delta^2} + \frac{\theta}{\delta} \left[1 + K\,(1 - \pi/6)\right] - \frac{1}{\bar{x}^2}\, t^*$$

Further we have obtained the expression for suction velocity at the point of separation for the boundary layer flow over a porous flat plate.

Lastly we have studied the Pohlhausen's problem of forced convection in a laminar boundary layer on a flat plate and obtained an approximate solution for cooling problem and adiabatic wall.

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