

## Preface

The thesis is aimed at studying the motion of viscous incompressible fluid through porous media. It is also intended to investigate theoretically the nature of the flow of viscous (stratified) incompressible fluid over a porous bed and tried to analyse the fundamental features at length. In laminar flow, the fluid adheres to certain laws viz. no slip condition is maintained at the rigid boundary and the particles of the fluid moves parallel to the boundary and has the magnitude of the velocity proportional to the distance from the rigid boundary. The relation between stress and the strain is governed by Stokes Law.

The flow region for viscous stratified fluid in this study of consideration, is divided into two zones. Zone-1 pertains to the flow called free flow governed by Navier-Stokes equations in the region between the permeable upper plate and lower porous bed and the Zone-2 pertains to the flow in the porous Zone governed by modified Darcy's Law.

Stokes hypothesis and the incompressible assumption of the viscous fluid in Zone-1 make the fundamental Navier-Stokes equations amenable to integration which otherwise impossible in the general case.

The intention of the study of the motion of viscous incompressible stratified fluid over a porous bed is that stratification and porosity factor may provide a scope to evolve technique for studying the pore size of the porous media. The physical reason is that the stratification or

porosity or both may retard or accelerate the flow depending on the magnitude of the stratification factor. The magnitude of retardation or acceleration is also related to the slip parameter, stratification, porosity factor and also Reynolds number  $R$ . Hence it may be expected that these factors might provide a technique for studying pore size in a porous media which might be significant in petroleum industry.

The topic has provided exact solution of many problems of practical interests as has been reiterated in a number of research papers.

The present work aims at studying certain problems of laminar viscous incompressible fluid and viscous stratified fluid over a porous bed under applied forces and natural.

The content of the topics are arranged in six chapters. Chapter one is the review work and deals with the introduction of the theses. The remaining chapters in succession are concerned with stratified fluid flows, Boundary layer effects on stratified fluid flows, Flow of Viscous fluid through circular pipe, MHD fluid flows and flow of viscous incompressible fluid.

Synopsis of the work, review of the allied works and the discussion of the result are given in the general introduction and also in the introduction of each paper contained in the respective chapter. A broad reference of the whole work has been given in the last chapter. Also references are given at the end of each chapter.