Preface

Many natural phenomena and industrial processes like atmospheric flow due to temperature difference, designing chemical processing equipment, crop damages due to freezing etc., involve free convective flows of heat and mass transfer. Hence in this dissertation, we have carried out a detailed numerical study on the heat and mass transfer of free steady convective flows.

In Chapter I, we have presented preliminary aspects of the convective flows through porous media. In Chapter II, significant earlier contributions related to the problems studied in the thesis are summarized.

Chapter III extends the work of Asim Aziz *et al*. (2014) to understand the effect of magnetic fluid on a steady boundary layer slip flow along with heat and mass transfer over a flat porous plate embedded in a porous medium.

Chapter IV presents the effect of Hall current on heat and mass transfer of free convective flow over a flat porous plate embedded in a porous medium. The effects of permeability, magnetic parameter, Schmidt number, Soret number and Hall parameter over velocity, temperature and concentration profiles, Skin friction, rate of heat and mass transfer at the plate are discussed in detail.

Chapter V investigates the combined effects of Hall and ion-slip currents on steady free-convective MHD flow of an incompressible viscous electrically conducting fluid with heat and mass transfer over a porous flat plate embedded in a porous medium.

Chapter VI analyses the effect of thermal diffusion and magnetic field on the steady free convective viscous incompressible flow of an electrically conducting fluid along with heat and mass transfer due to a rotating disk embedded in a porous medium.

Chapter VII deals with the heat and mass transfer of three dimensional MHD free convective flow over a flat porous plate embedded in a porous medium.

Chapter VIII investigates the effect of thermal radiation and chemical reaction on three dimensional MHD fluid flow in a porous medium.

Chapter IX summarizes the significant results obtained from these problems.

In all the above mentioned problems, the effect of MHD fluid flows through porous medium are studied. The similarity transformations are used to transform the governing partial differential equations into nonlinear ordinary differential equations.

The resulting system of ordinary differential equations are solved by shooting procedure using fourth order Runge-Kutta method. The numerical results of the flow characteristics are presented graphically with the help of the mathematical software FORTRAN Powerstation and Mathematica 8.0.

The values of the non-dimensional parameters such as Prandtl number, Schmidt number etc., are taken in such a way to represent real fluids for example Pr is taken as 7.0, to represent water.

All the important findings are summarized in detail as the last chapter. In order to establish the accuracy of the present work, particular results are compared with those available in the literature. In all the problems, the agreement between particular cases of the work reported in this thesis with the previous work is found to be exact.

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