EXACT SOLUTIONS OF SOME HYDROMAGNETIC AND HYDRODYNAMIC CONVECTIVE FLOW PROBLEMS

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The significance of this thesis is to analytically investigate some heat and mass transfer flow under various boundary conditions. Throughout the thesis, the fluids are considered to be viscous, incompressible and electrically conducting.

This thesis consists of eight chapters and primary purpose of the study is to investigate the influence of magnetic fields in the aforesaid flows under various physical circumstances. The flow geometries are one- dimensional accompanied by some simplifying assumptions on the continuity equation, energy equation, Navier-Stokes equations and the Species continuity equation.

Throughout the investigation, the flow is considered to be unsteady. In all the problems, the fluid is considered to be non- gray and optically thick. The Joule heating effect as well as the viscous dissipations of energy has been neglected throughout the study. Effect of induced magnetic field is considered only in Chapter II and Chapter VIII. Medium of flow is taken porous on chapter V, chapter VI and chapter VII. With the exception of the fourth chapter, the remaining chapters of the present work deal with radiation effect. Thermal diffusion effect is considered in second, third, sixth, seventh and eighth chapters while diffusion thermo effect is considered in fourth and fifth chapters. Furthermore condition of parabolic ramped temperature and concentration is taken in chapter III whereas arbitrary ramped temperature condition is studied in chapters from V to VIII.

The mathematical models of the problems considered in the thesis are idealized to a considerable extent by imposing some physically realistic constraints. Solutions of the resulting governing equations are obtained by adopting closed form of Laplace transform technique. There is a wide scope of reinvestigation of the same problems numerically by reducing the number of constraints. In this regard, Crank- Nicolson implicit finite difference method, finite element method, Runge- Kutta method, shooting method, etc. may be suggested for performing analysis.

In all the problems included in the thesis, viscosity is considered to be constant. It is possible to reinvestigate the problems taking variable viscosity into account.

Although the results included in the thesis are theoretical, they can be applied to a variety of engineering, technology and industrial sectors. Further, we have left enough scope to generalize all the problems. As a result, the analytical and numerical aspects of the research activity can be improved.

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