ABSTRACT

Combined heat and mass transfer on mixed convection flow with chemical reaction are of importance in many processes and have, therefore, received a considerable amount of attention in recent years. Numerous studies have been performed in recent years to investigate the effects of various physical phenomena on boundary layer flow with heat and mass transfer over a wedge surface due to the extensive applications of this flow in metal casting technology, underground aquifer-energy storage, ceramic engineering, soil mechanics, agricultural fields and paper/textile technology. Owing to these and many other applications, certain studies on thermophoresis particle deposition, thermal stratification, heat radiation, chemical reaction, variable viscosity, heat and mass transfer in steady MHD flows have been carried out in this work. This thesis presents some investigations on nonlinear heat and mass transfer on steady mixed convection flow over a wall of the porous wedge under different physical situations with or without chemical reaction for magnetic or non-magnetic cases. This thesis consists of an introductory chapter and five main chapters dealing with the above mentioned problems.

The fluid is assumed to be viscous, incompressible and Boussinesq. Governing nonlinear partial differential equations are transformed to nonlinear ordinary differential equations by utilizing similarity transformation and then solved numerically using R.K.Gill method. Numerical calculations
up to third level of truncation are brought out for different values of dimensionless parameters in the problem. The results are presented graphically and the conclusion is drawn that the flow field and other quantities of physical interest are significantly influenced by these parameters. It is expected that this research may prove to be useful for the study of movement of oil or gas and water through the reservoir of an oil or gas field, in the migration of underground water and in the filtration and water purification processes. The results of the problem are also of great interest in geophysics in the study of interaction of the geomagnetic field with the fluid in the geothermal region. It is hoped that the results obtained will not only provide useful information for applications, but also serve as a complement to the previous studies.