International J. of Math. Sci. & Engg. Appls. (IJMSEA)
ISSN 0973-9424, Vol. 7 No. III (May, 2013), pp. 317-334

LIE GROUP ANALYSIS OF HEAT AND MASS TRANSFER EFFECTS ON STEADY MHD FREE CONVECTION FLOW PAST AN INCLINED SURFACE WITH VISCOUS DISSIPATION

HYMAVATHI T. MALLIPRIYA[1] AND MGNANESWARA REDDY[2]
[1] Department of Mathematics,
Adikavi Nannaya University,
Rajahmundry A. P. - 533 005, India
E-Mail: hyma.talla@gmail.com
[2] Department of Mathematics,
Acharya Nagarjuna University - 523 001, India

Abstract

This article concerns with a steady two-dimensional flow of an electrically conducting incompressible dissipating fluid over an inclined semi-infinite surface with heat and mass transfer. The flow is permeated by a uniform transverse magnetic field. A scaling group of transformations is applied to the governing equations. The system remains invariant due to some relations among the parameters of the transformations. After finding three absolute invariants, a third-order ordinary differential equation corresponding to the momentum equation, and two second-order ordinary differential equations corresponding to energy and diffusion equations are derived. The coupled ordinary differential equations along with the boundary conditions are solved numerically. Comparisons with previously published work are performed and the results are found to be in very good agreement. Many results are obtained and a representative set is displayed graphically to illustrate the influence of the various parameters on the dimensionless velocity, temperature and concentration profiles. It is found that the velocity increases with an increase in the thermal and solutal Grashof numbers. The velocity and concentration of the fluid decreases with an increase in the Schmidt number. The results, thus, obtained are presented graphically and discussed.

Key Words : *Lie group analysis, Natural convection, MHD, Viscous dissipation, Heat and mass transer, Inclined Surface.*