

Exact Solutions on Mixed Convection Flow of Accelerated Non-Coaxial Rotation of MHD Viscous Fluid with Porosity Effect

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Abstract:

Mixed convection of unsteady non-coaxial rotation flow of viscous fluid over an accelerated vertical disk is investigated. The motion in the fluid is induced due to the rotating and buoyancy force effects. The problem is formulated and extended in terms of coupled partial differential equations with some physical boundary and initial conditions. The non-dimensional equations of the problem are obtained by using the suitable non-dimensional variables. The exact solutions of non-coaxial velocity and temperature profiles are obtained by using Laplace transform method which are satisfying all the initial and boundary conditions. Skin friction and Nusselt number are also calculated. The physical significance of the mathematical results is shown in various plots and is discussed for Grashof and Prandtl numbers as well as magnetic, porosity, time and accelerated parameters. It is found that, the velocity with the effect of acceleration is higher compared to constant velocity. In limiting sense, the present solutions are found identical with published results.

Keywords: Non-coaxial rotation; MHD; Porous medium; Laplace transform; Viscous fluid