MHD Flow And Heat Transfer For The Upper-Convected Maxwell Fluid Over A Stretching/ Shrinking Sheet With Prescribed Heat Flux

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Abstract. In this paper, the effect of Magnetohydrodynamic (MHD) towards the flow and heat transfer for the upper-convected Maxwell (UCM) fluid over a stretching/shrinking sheet with prescribed heat flux (PHF) is considered. The governing equations are transformed into a set of ordinary differential equations (ODEs) by using the similarity transformation. Shooting technique is applied to solve the transform ODEs. Numerical solutions of the local temperature, reduced skin friction coefficient, velocity and temperature profiles are obtained. The features of the flow and heat transfer characteristics for various values of the Prandtl number Pr, the magnetic parameter M, the suction parameter S, the stretching/shrinking parameter and the Maxwell parameter are analyzed and discussed.

Keywords: Magnetohydrodynamic (MHD); Upper-Convected Maxwell fluid (UCM); Stretching/Shrinking Sheet; Heat transfer.

INTRODUCTION

The concept of boundary layer flow on a continuous solid surface moving at constant speed was first investigated by Sakiadis [1]. This boundary layer flow is differ from the Blasius flow that pass over a flat plate. This discrepancy occurs because of the entrapment of the ambient fluid in boundary layer flow on a continuous solid surface. The Sakiadis's theoretical prediction of Newtonian fluids was then validated experimentally by Tsou et al. [2]. The fluid dynamics to a stretching sheet play a pivotal role in many areas such as extrusion and industrial manufacturing processes. The production of sheeting material arises in number of industrial manufacturing processes including metal and polymer sheets. Crane [3] presented an exact solution for the steady two-dimensional flow due to a stretching surface in a quiescent fluid. Many authors have considered this problem in various aspects sine the pioneering work of Crane [3]. The effort is to obtain the similarity solutions for the underlying problems.