HYDROMAGNETIC BOUNDARY LAYER MICROPOLAR FLUID FLOW OVER A STRETCHING SURFACE EMBEDDED IN A NON-DARCIAN POROUS MEDIUM WITH RADIATION

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We have studied the effects of radiation on the boundary layer flow and heat transfer of an electrically conducting micropolar fluid over a continuously moving stretching surface embedded in a non-Darcian porous medium with a uniform magnetic field. The transformed coupled nonlinear ordinary differential equations are solved numerically. The velocity, the angular velocity, and the temperature are shown graphically. The numerical values of the skin friction coefficient, the wall couple stress, and the wall heat transfer rate are computed and discussed for various values of parameters.

1. Introduction

Eringen [7] introduced the concept of micropolar fluid in an attempt to explain the behavior of a certain fluid containing polymeric additives and naturally occurring fluids such as the phenomenon of the flow of colloidal fluids, real fluid with suspensions, liquid crystals, and animal blood. The theory of thermomicropolar fluids has been developed by Eringen [8], taking into account the effect of microelements of fluids on both the kinematics and conduction of heat. Micropolar fluid theory has been used to describe in detail the effect of dirt in journal bearing, see [2, 11, 14, 22]. The review articles by Ariman et al. [4, 5] describe some of the various applications which have been explored.

Boundary layer on continuous surface is an important type of flow occurring in a number of technical problems. Examples may be found in continuous casting, glass fiber production, metal extrusion, hot rolling, textiles, and wire drawing (see [3, 20]). Sakiadis [17] initiated the theoretical study of boundary layer on a continuous semi-infinite sheet moving steadily through an otherwise quiescent fluid environment, whereas its heat transfer aspect was studied by Tsou et al. [23]. Karwe and Jaluria [9] carried out a numerical study of the transport arising due to the movement of a continuous heated body.

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