Dual solutions in MHD boundary layer flow of Carreau fluidover a shrinking sheet with convective boundary condition

ABSTRACT

This paper studies on two-dimensional magnetohdrodynamics (MHD) boundary layer flow of Carreau fluid towards a non-linear shrinking sheet with convective boundary condition and non-linear thermal radiation. Appropriate similarity transformations are introduced to convert the governing equations into non-linear ordinary differential equations. The equations along with the transformed boundary conditions are then solved numerically using shooting method in Maple. The effects of various parameters such as the shrinking parameter, the suction parameter, the radiation parameter, the temperature ratio parameter, the magnetic parameter, the Prandtl number and the Biot number on the skin friction coefficient, the heat transfer rate, the fluid velocity and the fluid temperature are discussed and shown in tables and graphs. It is found that dual solutions are obtained at certain values of parameters and the higher the value of suction and magnetic parameter, the higher the heat transfer rate. As the radiation parameter increases, the fluid temperature decreases.

Keyword: Carreau fluid; MHD; Shrinking sheet; Suction; Thermal radiation