Effect of Internal Heat Generation on Free Convective Power Law Variable Temperature Past Vertical Plate Considering Exponential Variable Viscosity and Thermal Diffusivity

Authors : Tania Sharmin Khaleque, Mohammad Ferdows

Abstract : The flow and heat transfer characteristics of a convection with temperature-dependent viscosity and thermal diffusivity along a vertical plate with internal heat generation effect have been studied. The plate temperature is assumed to follow a power law of the distance from the leading edge. The resulting governing two-dimensional equations are transformed using suitable transformations and then solved numerically by using fifth order Runge-Kutta-Fehlberg scheme with a modified version of the Newton-Raphson shooting method. The effects of the various parameters such as variable viscosity parameter β_1, the thermal diffusivity parameter β_2, heat generation parameter c and the Prandtl number Pr on the velocity and temperature profiles, as well as the local skin- friction coefficient and the local Nusselt number are presented in tabular form. Our results suggested that the presence of internal heat generation leads to increase flow than that of without exponentially decaying heat generation term.

Keywords : free convection, heat generation, thermal diffusivity, variable viscosity

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