THERMAL MODELING OF FREE CONVECTION AND BOUNDARY LAYER CONTROL

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Abstract

Gyarmati's variational principle, a significant development in the field of thermodynamics of irreversible processes, is employed to study suction and injection effects in free convection boundary layer flow over a non-isothermal cone. The velocity and temperature distributions inside their respective boundary layer are considered as simple polynomial functions and the variational principle is formulated for Prandtl number greater than unity. The Euler-Lagrange equations are reduced to coupled polynomial equations in terms of boundary layer thicknesses. The skin friction (shear stress) and heat transfer (Nusselt number) were computed for various values of suction and injection parameter, Prandtl number, wall temperature exponent and the cone angle parameter. The comparison of the present
solution with an available numerical solution shows good agreement.