

Exact solution for unsteady free convection flow of Casson fluid in vertical channel

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ABSTRACT

The influence of free convection flow on unsteady Casson fluid over a vertical channel is studied in this paper. The governing equation consists of partial differential momentum and energy equations have been transformed into non-dimensional equations by using the appropriate nondimensional variables. The expression of exact solutions for nondimensional velocity and temperature profiles are obtained by using the Laplace transform method. The obtained exact solutions are found satisfied all the initial and boundary conditions. The behaviour of velocity and temperature profiles influenced by Casson fluid parameter, Grashof number, Prandtl number and time are plotted graphically and presented in tables. It can be observed that, the velocity profile and boundary layer thickness decrease when the values of Casson fluid parameter and Prandtl number increase. This is due to the increase of viscous force and retard the movement of the velocity. The present result is validated when the obtained exact solution of velocity is compared with published result and found in a good agreement.

KEYWORDS:

Unsteady free convection flow; Casson fluid; Vertical channel