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Boundary Layer Flow of a Casson Nanofluid Past a Vertical Exponentially Stretching Cylinder in the Presence of a Transverse Magnetic Field with Internal Heat Generation/Absorption

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Abstract : An analysis is carried out to investigate the effect of magnetic field and heat source on the steady boundary layer flow and heat transfer of a Casson nanofluid over a vertical cylinder stretching exponentially along its radial direction. Using a similarity transformation, the governing mathematical equations, with the boundary conditions are reduced to a system of coupled, non –linear ordinary differential equations. The resulting system is solved numerically by the fourth order Runge – Kutta scheme with shooting technique. The influence of various physical parameters such as Reynolds number, Prandtl number, magnetic field, Brownian motion parameter, thermophoresis parameter, Lewis number and the natural convection parameter are presented graphically and discussed for non – dimensional velocity, temperature and nanoparticle volume fraction. Numerical data for the skin – friction coefficient, local Nusselt number and the local Sherwood number have been tabulated for various parametric conditions. It is found that the local Nusselt number is a decreasing function of Brownian motion parameter Nb and the thermophoresis parameter Nt.

Keywords : casson nanofluid, boundary layer flow, internal heat generation/absorption, exponentially stretching cylinder, heat transfer, brownian motion, thermophoresis
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