Flow and heat transfer of hybrid nanofluid induced by an exponentially stretching/shrinking curved surface

ABSTRACT

The efficient performance of heat transfer fluid in terms of thermal conductivity plays a significant role in thermal engineering activities. In this work, the flow of boundary layer and heat transfer of hybrid nanofluid induced by an exponentially permeable stretching/shrinking curved surface is modelled and scrutinized numerically. Facilitated by bvp4c function, the ordinary differential equations are being solved. The implications of some intended parameters towards the physical quantities are plotted, while the comparison of results for the validation purpose is also tabulated. We found out that the boundary layer separation is deferred as copper volume fraction and curvature parameters increased. The stability analysis for the flow is conducted as the dual solutions are visible. The first (second) solution of the hybrid nanofluid flow is observed to be stable (unstable). For the physical solution, the increment in copper volume fraction leads to the accretion of the skin friction coefficient at the shrinking surface but has reduced the local Nusselt number. The presence of hybrid nanofluid has enhanced the velocity and temperature profiles. Generally, this study provides the initial prediction for the scientist and engineers in controlling the parameters to achieve the optimum desires for the related practical applications.

Keyword: Curved surface; Hybrid nanofluid; Dual solutions; Stability analysis