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Impact of variable magnetic field and convective boundary condition on a stretched 3D radiative flow of Cu-H2O nanofluid
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Abstract
The present study is dealt with the influence of a variable magnetic field and thermal radiation on three-dimensional flow of incompressible nanofluid over an exponentially-stretching sheet in association with a convective boundary condition. Patel model is employed in this study because this model contributes more thermal conductivity and hence the heat transfer capability of nanofluids compared to the Maxwell and Brinkman model. In the present analysis, base fluids such as water, 30% ethylene glycol, 50% ethylene glycol and nanoparticles such as Cu, Ag and Al2O3 are considered. The transformed governing differential equations are solved using fourth-order Runge-Kutta method along with shooting technique and secant method is employed for better approximation. The significant impact of the variable magnetic field and the thermal radiation on the dimensionless velocity, temperature, skin friction and the Nusselt number has been analyzed. The important outcome of the present study is that the Lorentz force due to the presence of the magnetic field impinges its resistance on the fluid motion leading to diminution of the wall shear stresses(axial as well as transverse) in association with a thinner momentum boundary layer and reduction in the heat transfer rate from the sheet developing thicker thermal boundary layer.

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