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Flow and Heat Transfer of Magnetohydrodynamic Three-Dimensional Maxwell Nanofluid over a Permeable Stretching/Shrinking Surface with Convective Boundary Conditions

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Abstract –

The flow and heat transfer of magnetohydrodynamic three-dimensional Maxwell nanofluid over a permeable stretching/shrinking surface with convective boundary conditions is numerically investigated. The partial differential equations governing the flow and heat transfer are transformed to a set of ordinary differential equations by using the suitable transformations for the velocity, temperature and concentration components. These equations have been solved numerically by employing the bvp4c function in Matlab. Numerical solutions are obtained for the skin friction coefficient and the local Nusselt number. Dual solutions are discovered and hence the stability analysis has been done to identify which solution is stable and physically realizable and which is not stable and which is not stable. Solutions are obtained for the skin friction coefficients and local Nusselt number for several values of the parameters, namely the suction parameter, Deborah number, Biot number and Prandtl number. The solutions are presented in some graphs and tables and are analyzed and discussed in detail.

Keywords **–**
Maxwell Nanofluid, Stretching/Shrinking Surface, Three-Dimensional Flow, Dual Solutions.

Nomenclature

a, b	constants
B_0	magnetic field ($Nm^{-1}A^{-1}$)
C	nanoparticle volume fraction
C_{fx}, C_{fy}	skin friction coefficients along the *x*- and *y*- directions, respectively