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Title: ON SOME PROBLEMS OF HEAT AND MASS TRANSFER IN NON-NEWTONIAN NANOFLUIDS OVER A STRETCHING/SHRINKING SHEET

Abstract: This study comprehensively explores the diverse magneto-hydrodynamic (MHD) nanofluid flow phenomena over various stretching and shrinking surfaces with distinctive physical and mathematical attributes considering multiple scenarios. We have considered the nanofluid flow because of its thermal characteristics. The influence of Williamson fluid on MHD nanofluid, dusty fluid on magneto nanofluid flow, and three-dimensional MHD nanofluid flow by considering different properties such as thermal radiation, entropy generations, variable viscosity, magnetic field, non-uniform heat source, chemical reaction, activation energy, and viscous dissipation, etc. have been analyzed. The motile microorganisms suspended nanofluid is another interesting concept for preparing bio-gages, bio-fuels, bio-fertilizers, etc. The phenomenon of mixing motile microorganisms in the fluid is known as bioconvection and this fluid is bioconvective. The microorganisms incorporated nanofluid flow on various attributes such as rotational cone, casson nanofluid, and couple stress nanofluid flowing on stretching sheets have been considered here. The velocity slip, thermal, solutal, and microbial Biot numbers have been considered as the boundary conditions for these models. The appropriate similarity transformations are utilized to convert these governing equations written in terms of partial differential equations of the model into the ordinary differential equations with the boundary conditions. These transformed non-linear coupled ordinary differential equations are solved using the Spectral Quasi Linearization Method (SQLM) and Bivariate Spectral Quasi Linearization Method (BSQLM) with the help of MATLAB programming, to get the solution. The characteristics of these fluids have been visualized concerning the potential parameters considered in that specific model for their flow, temperature, concentration, and microbial concentration profiles. The comparison of the physical quantities has been considered with the existing results to validate our model. The error graph and residual error graphs are also considered to check the accuracy and exactness of the numerical technique as well as the model. Spectral Quasi Linearization is based on a single-variable method while Bivariate Spectral Quasi Linearization is based on a two-variable method. Moreover, the mathematical explanation of the numerical technique followed by the influence of the key parameters has been included in the thesis.

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