UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT (MSP660)

MAGNETOHYDRODYNAMICS BOUNDARY LAYER FLOW AND HEAT TRANSPORT OF JEFFREY HYBRID NANOFLUIDS OVER AN INCLINED PLATE

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ABSTRACT

There are several uses for the study of fluid flow and heat transfer produced by a stretching medium, including the development of composite materials and thermal insulation. These applications acted as the driving force behind this study's study of the Jeffrey hybrid nanofluid in boundary layer region across an inclined plate. To formulate the issue, hybrid nanofluid was combined with copper (Cu) and aluminium oxide (Al_2O_3). By considering spherical, brick, cylindrical, platelet and blade shape nanoparticles, the influence of shape factor is studied. The Jeffrey hybrid nanofluid's governing nonlinear partial differential equations are changed into nonlinear ordinary differential equations using similarity transformation. The essential principle of MHD is a magnetic field that can induce electrical flow in a moving conductive fluid, influence force on the fluid, and change the magnetic field. The bvp4c method is used to numerically solve the nonlinear differential equations, and MATLAB software is then used to solve the system. Governing parameters for velocity and temperature profiles, skin friction and local Nusselt number are all graphically and numerically represented. The parameters involved in this model are alignment angle of the magnetic field parameter, the interaction of the magnetic field parameter, alignment angle of the incline plate, the mixed convection parameter, the radiation parameter, the volume fraction of the nanoparticles, and the nanoparticle shape factor have been investigated. It was observed that an increase in radiation parameter and volume fraction of the nanoparticles causes velocity and temperature increase. As the alignment angle of magnetic field, interaction of magnetic parameter, radiation parameter and volume fraction of nanoparticles increase, the skin friction also increases. For the radiation parameter, the Nusselt number is decreasing as the parameter increases. Additionally, it is thought that the different nanoparticle shapes result in significant differences in the energy and velocity functions of the Jeffrey hybrid nanofluid. Utilizing various nanoparticle shapes improves heat transfer through the fluid medium while also increasing the velocity of the base fluid. For all the governing parameters, the nanoparticles shape with the highest skin friction coefficient and Nusselt number is blades shape, followed by platelets shape, cylindrical shape, bricks shape and spherical shape.