Universiti Teknologi MARA

Aligned MHD Free Convection Flow of Magnetic Nanofluid over a Moving Vertical Plate with Convective Boundary Condition

Siti Nur Hidayatul Ashikin Binti Ibrahim

Report submitted in fulfillment of the requirements for Bachelor of Science (Hons.) Management Mathematics Faculty of Computer and Mathematical Sciences

June 2019

STUDENT'S DECLARATION

I certify that this report and the research to which it refers are the product of my own work and that any ideas or quotation from the work of other people, published or otherwise are fully acknowledged in accordance with the standard referring practices of the discipline.

……

SITI NUR HIDAYATUL ASHIKIN BINTI IBRAHIM

2016537793

JUNE 21, 2019

ABSTRACT

The present study investigates the behaviour of aligned magnetohydrodynamic (MHD) free convection flow of magnetic nanofluids over a moving vertical plate by considers two types of the mixtures of magnetic nanofluids which were water and kerosene based magnetic nanofluids. The convective boundary conditions were taken into consideration where the right surface of the plate was in contact with the cold fluid while the left surface of the plate was in contact with the hot fluid. The similarity transformation was used to reduce the partial differential governing equations into ordinary differential equations. Then, the reduced equations was coded into Maple software and solved by using Fourth – Order Runge – Kutta Method. The results of velocity and temperature profiles were illustrated graphically while the results of skin friction coefficient and Nusselt number were presented in tabulated data. The study found that the inclination angle of magnetic field, local Grashof number, interaction of magnetic and local Biot number parameters positively influenced the velocity profiles. Conversely, as the value of inclination angle of magnetic field, local Grashof number, interaction of magnetic parameters increased, the temperature profile decreased. However, an increasing in value of nanoparticle volume fraction and local Biot number elevated the temperature profile. The numerical results revealed that the value of skin friction coefficient was the highest when the plate moved against the flow while the value of Nusselt number was the biggest when the moving vertical plate moved with the flow of magnetic nanofluids. The study also concluded that Fe_3O_4 - kerosene was the most suitable magnetic nanofluids that can be used to enhance the rate of heat transfer since the value of Nusselt number in Fe_3O_4 - kerosene magnetic nanofluids was higher than Fe_3O_4 - water magnetic nanofluids in all states of plate. Comparison of the results obtained with the results from previous study was performed to prove the consistency of the results and excellent agreement was achieved.

TABLE OF CONTENTS