UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

MHD FLOW OF DUSTY CASSON FLUID OVER A STRETCHING SHEET WITH CONVECTIVE BOUNDARY CONDITIONS BY USING NUMERICAL METHOD

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The Casson model is an intriguing model, which is especially suitable for non-Newtonian fluids. There are many natural phenomena and industrial applications in which flow plays a major role. Fluid-solid flow, liquid-liquid flow, gas-solid flow, or gas-liquid flow could be involved. The interaction between them influences the flow characteristics significantly. Since non-Newtonian fluid flow has an impact on many industrial fields, single flows have received a lot of attention. However, the model cannot examine the fluid in the presence of solid particles. A two-phase flow model had been suggested in response to its limitations, which helps investigate the interaction between fluid and solid phases. Numerous studies have been done on two-phase flow, but more studies may be required to include non-Newtonian dusty fluid flow in a variety of situations, including geometrical structures, different dusty fluid types, and boundary conditions. As a result, the dusty Casson fluid boundary layer flow over a stretching sheet with an aligned magnetic effect and Convective Boundary Conditions (CBC) is numerically investigated. With the appropriate similarity variables, the equations that govern the Casson model and dust particles are reduced to nonlinear ordinary differential equations. The Runge–Kutta Fehlberg (RKF45) method is then applied to solve these transformed equations numerically. In both phases (fluid and particle), several physical parameters are studied and evaluated, including fluid particle interaction, Casson parameter, aligned angle, magnetic field, Prandtl number, Biot number and the specific heat ratio of the mixture on the velocity and temperature profiles. Graphical outputs for various values of the considered parameter are provided. The results showed that dust particles tend to reduce the fluid's velocity, whereas its temperature shows the reverse trend. The current results are anticipated to aid in the mathematical comprehension of the theory of two-phase flow, which will lead to more important studies in this area.