MHD WILLIAMSON BOUNDARY LAYER FLOW OVER STRETCHING SHEET IN DOUBLE STRATIFICATION MEDIUM

NUR ATIFAH AUNI BINTI JASMIN

Thesis Submitted in Fulfilment of the Requirement for
Bachelor of Science (Hons.) Mathematical Modelling and Analytics
College of Computing, Informatics and Mathematics
Universiti Teknologi MARA

2025

ABSTRACT

This research examines the behaviour of Magnetohydrodynamic (MHD) Williamson boundary layer flow over stretching sheet in double stratification medium. The study begins with a review of existing research to identify gaps in understanding MHD and Williamson fluid dynamics. A step-by-step approach was followed, starting with defining the governing equations and boundary conditions and ending with analysing results from numerical simulations. The Williamson parameter was incorporated into the momentum equation, and similarity transformations were used to convert partial differential equations into ordinary differential equations. These equations were solved using the Runge-Kutta method, with computations and visualizations performed in Maple software. The study demonstrates that incorporating the Williamson parameter into the momentum equation, in conjunction with various parameter combinations, significantly influences the skin friction coefficient, heat transfer rate, and mass transfer rate. The effects of the Williamson parameter, along with the magnetic parameter, porosity parameter, Prandtl number, Schmidt number, and double stratification, are analysed and presented through graphical illustrations, accompanied by a detailed discussion. Based on the result obtained, it is found that the Williamson parameter caused the momentum boundary layer thickness to decrease. Meanwhile the thermal boundary layer thickness and concentration boundary layer increases with the increase of Williamson parameter.

ACKNOWLEDGEMENT

Before all else, I am deeply grateful to Allah the Almighty for granting me the strength, knowledge, and perseverance to complete this research. Without His countless blessings and guidance, this journey would not have been possible.

My deepest gratitude goes to my supervisor, Madam Zanariah binti Mohd Yusof, for her invaluable guidance, encouragement, and unwavering support throughout the course of this thesis. Her expertise and insights have been instrumental in shaping this work, and I am truly grateful for her patience and dedication.

I would also like to extend my heartfelt thanks to my family, whose love, prayers, and constant support have been my foundation throughout this journey. Their unwavering belief in me has been a source of strength and motivation.

To my friends, thank you for being my pillar of support, for sharing in my challenges, and for celebrating every milestone along the way. Your encouragement and companionship have made this journey much more meaningful.

This research would not have been possible without the contributions and support of each of you. Thank you from the bottom of my heart.

TABLE OF CONTENTS