UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

FLOW AND HEAT TRANSFER OVER STRETCHING OR SHRINKING WEDGE IN HYBRID NANOFLUIDS USING TIWARI-DAS MODEL

MUHAMMAD SHAMIL ADLI BIN SAHRIN – 2021130835
NAQIB ARIF BIN ABDUL AZIZ – 2021119811
FATIMAH HAZIRAH BINTI ABU HASSAN ASHAARI – 2021117705

P57S22

Report submitted in partial fulfillment of the requirement
for the degree of
Bachelor of Science (Hons.) (Mathematics)
College of Computing, Informatics and Media

FEBRUARY 2023

ACKNOWLEDGEMENTS

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

First, we are grateful to Allah S. W. T. for giving us the strength in completing this final year project successfully.

I would like to express my gratitude to Dr Nor Azizah bt M. Yacob, a lecturer at Faculty of Computer and Mathematical Sciences in UiTM Jengka and has also assigned as my supervisor who had guided us a lot of tasks during two semester session 2022/2023. We also want to thank the lecturers and staff in UiTM Seremban 3 for their cooperation during our completing the final year project that had given valuable information, suggestions and guidance in the compilation and preparations this project. Not forgotten also to our MSP660 lecturer's Nur Lina Binti Abdullah for her guidance in completing this report.

Deepest thanks to all our friends and everyone, that have been contributed by supporting our work and help us during the final year project's progress till it is fully completed.

Last but not least, thanks and appreciation to our parents and family for their cooperation, encouragement, constructive suggestion and full support from the beginning till the end in the completion of report.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This study intends to discover the flow and heat transfer over stretching or shrinking wedge in hybrid nanofluid. Yacob et al. (2011) conducted a study on steady two-dimensional boundary layer flow past a static or a moving wedge immersed in nanofluids. They have numerically studied the Falkner-Skan problem for a static or moving wedge immersed in nanofluids. They obtained triple solution in stretching/shrinking parameter in nanofluids. Motivated by the growing trend of hybrid nanofluids, which are driven by heat and flux transfer across moving surfaces and have a wide range of industrial applications. Therefore, we will extend the paper of Yacob et al. (2011), but in hybrid nanofluid to study the effect of wedge parameter, and stretching or shrinking parameter on the velocity, temperature profiles, local skin friction coefficient and local Nusselt number. The governing equations were transformed into non-linear ordinary differential equations using a similarity transformation, which were then solved using the bvp4c function in MATLAB. Two types of nanoparticles, copper (Cu) and alumina (Al_2O_3) were considered in the water-based hybrid nanofluid. The results showed that increasing the wedge angle (m) leads to an increase in the skin friction coefficient and heat transfer rate at the surface. The volume fraction of nanoparticles is fixed at $\varphi_1 = \varphi_2 = 0$. Additionally, dual solutions were only found to exist for the shrinking sheet. As the value of the shrinking parameter increases, the range of boundary layer separation also increases.