UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

RAINFALL FORECASTING MODEL USING UNIVARIATE TECHNIQUES

(P40M22)

AINUR SHUHADA BINTI ABDUL SHUKUR (2019219112)

NURHAFISZA AFZAN BINTI HASSAN (2019218366)

ZAMRIA BINTI AWALUDIN (2019253746)

Report submitted in partial fulfilment of the requirement

for the degree of

Bachelor of Science (Hons.) (Mathematics Management)

Faculty of Computer and Mathematical Sciences

AUGUST 2022

ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and the Most Merciful. Alhamdulillah, all praises to Allah for the strengths and his blessing in completing this technical report successfully.

We would like to express our deep and sincere gratitude to our supervisor Mrs Norliana Binti Mohd Lip, whose guidance, careful reading, and constructive comments were valuable. Her timely and efficient contribution helped us shape this into its final form and we express our sincerest appreciation for her assistance in any way that we may have asked. We are also deeply indebted to our MSP660 lecturer, Dr Rossidah Binti Wan Abdul Aziz for her understanding, assistance, vital encouragement, support, and knowledge regarding this project.

We also want to give special thanks to our friends who have directly guided us in writing this assignment. We express our deepest appreciation to our beloved parents, family, friends and colleagues for their continuous support and encouragement are greatly appreciated.

TABLE OF CONTENTS

ABSTRACT

Rainfall is crucial to daily living, whether it be for agriculture, the development of industry, or human survival. Floods, one of the most frequent natural disasters in Malaysia, are caused by poor management and a lack of rainfall predictions. Hydrologists claim that there are numerous factors that lead to flood events. The meteorological component (also known as climate change) and the change in land use elements are the two most important factors. In recent decades, flooding has been aggravated by these two variables, particularly in areas with monsoonal catchments like Malaysia. This study aims to measure the impact of rainfall during extreme rainfall in Kelantan. To forecast the rainfall in Kelantan, univariate approaches were used. There are three objectives in this study. Firstly, to model a mathematical equation of rainfall in Kelantan specifically by using univariate modelling techniques. Next, to identify the best model in univariate modelling techniques using Single Exponential Smoothing, Double Exponential Smoothing and Holt's method by comparing the Root Mean Squared Error (RMSE), Mean Squared Error (MSE) and Mean Absolute Percentage Error (MAPE). Lastly, the study would also measure the forecast value of the Kelantan rainfall model for a year ahead based on the selected best model of univariate modelling techniques. The best model will be selected to forecast the rainfall starting January 2014 until December 2020. Findings show that Single Exponential Smoothing (SES) was determined to be the best model to anticipate the future rainfall in Kelantan a year in advance. The maximum value for this model occurs in December, but it continues to be in a position that is not much different in a year. There is no need to store data for many periods because it requires the retention of only a limited amount of data. Therefore, the Single Exponential Smoothing Model is appropriate for rainfall forecasting.