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TECHNICAL REPORT
FINAL YEAR PROJECT
CS249
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MATHEMATICAL PREDICTION FOR MEASLES USING SEIR MODEL

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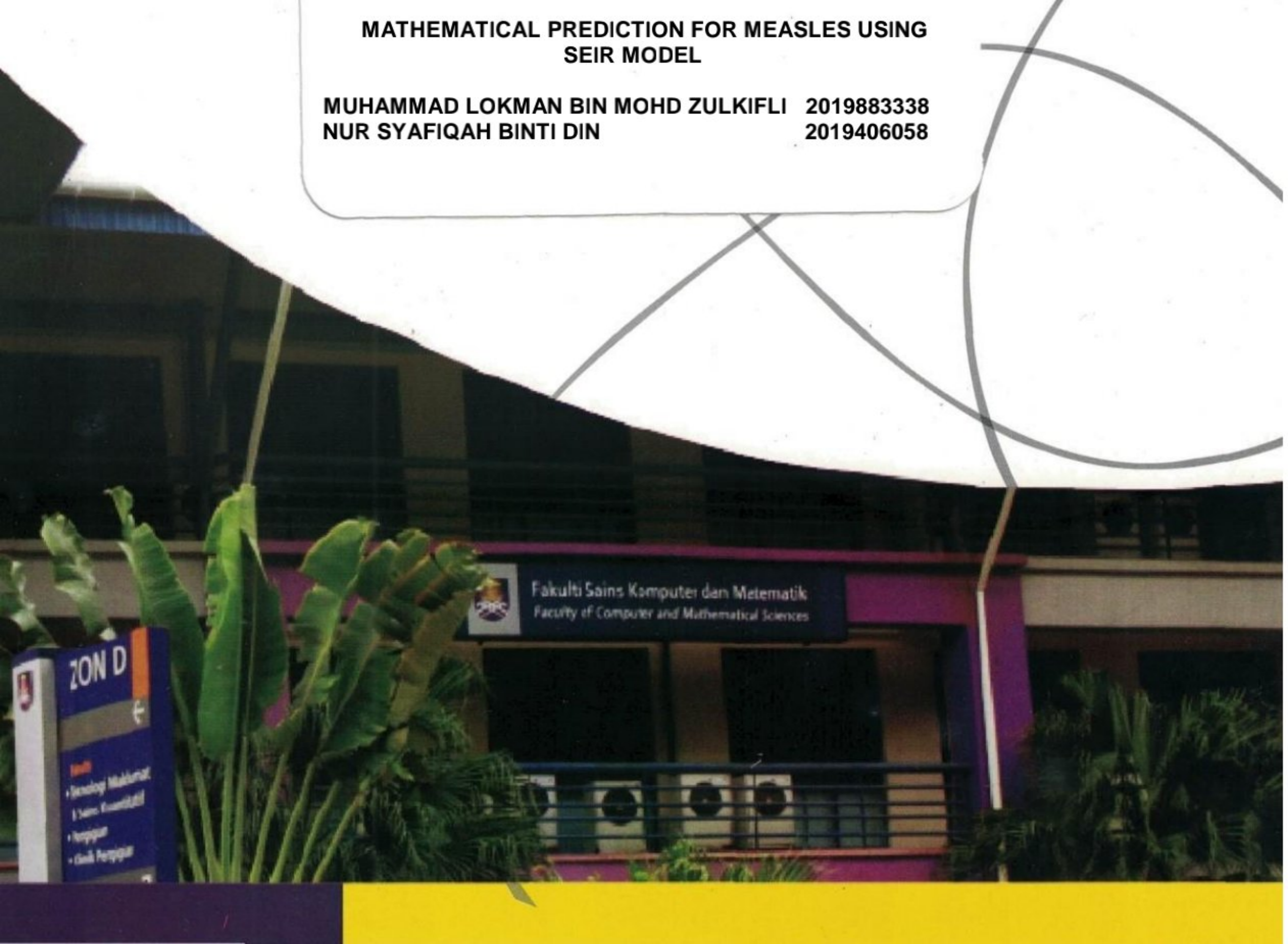

ACKNOWLEDGEMENTS

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ABSTRACT

This Final Year Project focusing in solving and study of the susceptible, exposed, infected and recovered model (S,E,I,R) for measles disease. This project is based on the prediction of (S,E,I,R) measles models, which are used to study the overall to achieve the title and solve the objective. Measles is the higher contagious that can spread in community population depending on the number of people susceptible or infected and depending in their movement in a community. Measles disease data are mostly the lending cases population in England and Wales for 2017.

Firstly, this project formulate the S,E,I,R model of measles by refer to main article. The parameter of model like B, β,μ,α,σ, and γ are used to formulate into the model. The parameter using for represent of the description of measles model.

Furthermore, this project continue to investigate the stability analysis of disease free equilibrium and endemic equilibrium. Before proving the solution to obtained the final answer, investigation of main research is make to show step by step. In solving the analysis stability, reproductive number are prove using jacobian matrix to show the reproductive number is disease free equilibrium which is smaller than zero. Next, stability analysis for disease free equilibrium and endemic equilibrium are showed and both system are stable which is the the values of λ are negative.

Finally, prediction for measles cases are shown using Maple software. Data 2017 are used in the result and prediction until 2027 also shown. Graph between S,E,I,R model and time in 10 years shown in Figure 5.5. Prediction cases for 10 years shown a improvement because of vaccination. Overall, cases for all model were decrease.

1 INTRODUCTION

1.1 Research Backgroud

According to Cui et al. (2014), Childhood diseases are the most common form of infectious diseases such as measles. Measles is a respiratory infection caused by a virus belonging to the Morbillivirus genus Peter (2018) . The disease is conveyed either directly or indirectly through respiration following coming into touch with fluids from an infected person's nose and mouth Farman et al. (2020). Respiratory droplets and tiny aerosol particles can spread measles through the air. An infected person can release the virus into the air when they cough or sneeze. These respiratory particles can stick to things and surfaces. If someone comes into contact with a contaminated object, such as a door handle, and then touches your face, nose, or mouth, you can become infected. The measles virus can survive outside the body for a longer period of time than you might believe. In fact, it can stay infectious for up to two hours in the air or on surfaces. According to Higuera (2019), measles (rubella) is extremely contagious. This means that the infection can easily transfer from one person to another.

Figure 1.1: Measles Disease.

According to Perry & Halsey (2004), after an incubation period of 8–12 days, measles begins with increasing fever (to 39C–40.5C). Symptoms intensify over the 2–4 days before the onset of rash and peak on the first day of rash. The rash is usually first noted on the face and neck, appearing as discrete erythematous patches 3–8 mm in diameter. The rash lasts for 3–7