ABSTRAK

COVID-19 adalah penyakit menular yang disebabkan oleh virus yang bernama *Severe Acute Respiratory Syndrome Coronavirus 2* (SARS-CoV-2). Penyebaran COVID-19 dapat dipelajari menggunakan suatu model matematika. Dalam penelitian ini, dikembangkan model $SEIQR$ (Susceptible, Exposed, Infected, Quarantine, Recovered) yang dibangun dengan memetakan dinamika sub-populasi yang terdiri dari individu rentan, terpapar, terinfeksi, dikarantina, dan sembuh. Analisis kestabilan dilakukan terhadap titik ekuilibrium bebas penyakit dan titik ekuilibrium endemik pada model untuk menentukan kondisi di mana penyebaran penyakit dapat dihentikan atau dikendalikan. Setelah analisis kestabilan dilakukan, diperoleh kesimpulan bahwa titik ekuilibrium bebas penyakit stabil asimtotik jika $\Re_0 < 1$, sedangkan titik ekuilibrium endemik stabil asimtotik jika $\Re_0 > 1$. Selain itu, simulasi numerik dilakukan untuk memverifikasi hasil analisis dan mengamati perilaku penyebaran COVID-19.

Kata kunci: *COVID-19, Model SEIQR, Analisis Kestabilan, Simulasi Numerik*

ABSTRACT

COVID-19 is an infectious disease caused by the virus named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). The spread of COVID-19 can be studied using a mathematical model. In this study, an SEIQR (Susceptible, Exposed, Infected, Quarantine, Recovered) model was developed by mapping the dynamics of sub-populations consisting of susceptible, exposed, infected, quarantined, and recovered individuals. Stability analysis was performed on the disease-free equilibrium point and the endemic equilibrium point of the model to determine the conditions under which the spread of the disease can be stopped or controlled. After conducting the stability analysis, it was concluded that the disease-free equilibrium point is asymptotically stable if $\Re_0 < 1$, while the endemic equilibrium point is asymptotically stable if $\Re_0 > 1$. Additionally, numerical simulations were conducted to verify the analysis results and observe the behavior of COVID-19 spread.

Keywords: *COVID-19, SEIQR Model, Stability Analysis, Numerical Simulations*