

**UNIVERSITI TEKNOLOGI MARA**

**NUMERICAL STUDY OF LORENZ'S  
EQUATION BY THE BANACH  
CONTRACTION METHOD, P03S23**

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## ABSTRACT

This studied explores the application of the Banach Contraction Method (BCM) and its modification, the Multistage Banach Contraction Method (MBCM). The two methods are applied to solve the Lorenz's equation, a nonlinear system with chaotic behavior. The goal is to assess their accuracy and efficiency through comparison with the widely-used RK4 method. MBCM has been applied to approximate the numerical solution of the Lorenz's equations. In contrast to the standard BCM, which faces difficulties as the solution point deviates from the initial position, the multistage approach is employed to achieve more accurate solutions over wider intervals. The convergence of MBCM and RK4 solutions is discussed, emphasizing the reliability of MBCM within specified time domains. Maximum global errors for each variable further validate the superiority of MBCM over BCM. The findings recommend using MBCM with a small step size for accurate solutions to the Lorenz equations, achieving a balance between computational efficiency and precision. Moreover, employing this method yields favorable outcomes in solving nonlinear differential equations.

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