UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

SOLVING KLEIN-GORDON EQUATION USING BANACH CONTRACTION METHOD

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The Klein-Gordon equation, often known as the Dirac Oscillator (DO), is one of the most infamous equations that has been applied in modern relativity quantum physics. The Sumudu Decomposition Method (SDM), Variational Iteration Method (VIM), Laplace Decomposition Method (LDM), Adomian Decomposition Method (ADM), Homotopy Perturbation Method (HPM), and many other methods have been proposed in recent years to solve the Klein-Gordon equation. However, there are still some drawbacks to the nonlinear in these methods, particularly the nonlinear term is difficult and complex to compute. Therefore, Banach Contraction Method (BCM) will be utilised in this study to examine its accuracy whether it can be a new approach to solving the linear Klein-Gordon equation. Four cases of the linear Klein-Gordon equation were identified, and they were presented effectively in this report. All cases demonstrated that, as the iteration is increasing, the solution will be leading to the close form of the exact solution using BCM. Hence, the initial value problems of the Klein-Gordon equations are successfully solved using the BCM. Therefore, this study demonstrates that the BCM is more reliable and simpler when dealing with linear Klein-Gordon equation. As for recommendation, the researchers in the future can conduct a study on solving the nonlinear Klein-Gordon equation by using BCM.