

**APPLICATION OF LEAST SQUARE METHOD AND
CONJUGATE GRADIENT METHOD FOR SOLVING SECOND
ORDER DIFFERENTIAL EQUATION**

NUR FATONAH BINTI KAMSANI

**BACHELOR OF SCIENCE (HONS.)
COMPUTATIONAL MATHEMATICS
UNIVERSITI TEKNOLOGI MARA**

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DECLARATION BY CANDIDATE

I certify that this report and the project to which it refers is the product of my own work and that any idea or quotation from the work of other people, published or otherwise are fully acknowledged in accordance with the standard referring practices of the discipline.

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NUR FATONAH BINTI KAMSANI

2016299288

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ABSTRACT

Nowadays, solving second-order nonhomogeneous ordinary differential equations with Boundary Value Problem (BVP) is very important as it is commonly appeared in wide range of fields and professions such as physics and engineering. Usually, there are two theoretical methods used to solve this problem which are undetermined coefficient and variation of parameters.. However, these theoretical methods are quite complicated, difficult to understand and take time. Researcher tends to use numerical method in the form of least square method which is quite simple and easy compared to the theoretical method. In this research, there are five ode problem selected and solved by using both theoretical and least square method. The functions selected are based on theoretical problem which are trigonometric, algebraic and exponential. Towards the end of least square method, Conjugate Gradient is used to solve the inverse matrix to avoid ill-conditioned matrix. The error is analysed based on solution of both exact and approximate methods. Numerical results show that Least Square Method can solve second-order nonhomogeneous ordinary differential equations with BVP in terms of the error analysis made by both theoretical and numerical methods.

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