UNIVERSITI TEKNOLOGI MARA

BACKWARD DIFFERENTIATION FORMULAE WITH VARIABLE STEPSIZE VARIABLE ORDER FOR SOLVING STIFF DELAY DIFFERENTIAL EQUATIONS

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

Faculty of Computer and Mathematical Sciences

January 2015

CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 25th November 2014 to conduct the final examination of Nora Baizura Binti Mohd Isa on her Master of Science thesis entitled "Backward Differentiation Formulae with Variable Stepsize Variable Order for Solving Stiff Delay Differential Equations" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The Panel of Examiners was as follows:

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institutions or non-academic institutions for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

This thesis describes the development of predictor-corrector variable stepsize variable order based on backward differentiation formulae (BVSVO) method and direct predictor-corrector variable stepsize variable order based on backward differentiation formulae (DBVSVO) method for solving first order and special second order stiff delay differential equations respectively. The predictor and corrector formulae are represented in divided difference form. The developed methods are implemented using variable stepsize variable order technique. In varying the stepsize, the coefficients of the methods need to be recomputed at every step which will create extra computational cost. Thus, in order to reduce the computational cost, the coefficients of the methods are computed by a simple recurrence relation. In solving first order stiff delay differential equations using the BVSVO method, the numerical results are compared with non-stiff method, single-step method and multistep method. From the numerical results, the BVSVO method has shown the efficiency and reliability for solving first order stiff delay differential equations in terms of total number of steps, maximum error and average error. The DBVSVO method is used to solve special second order stiff delay differential equations directly without reducing to first order equations. We present some test examples to check an accuracy and efficiency of the DBVSVO method. For comparison purposes, the same set of test examples is reduced to a system of first order equations and solved using the BVSVO method. The numerical results for solving special second order stiff delay differential equations using the DBVSVO method is better compared with the BVSVO method in term of total number of function evaluations.

ACKNOWLEDGEMENT

In the Name of Allah the Most Compassionate the Most Merciful

First and foremost, I would like to express my very great appreciation to Dr Fuziyah Ishak, my supervisor, for her patience, guidance, encouragement and constructive criticisms of this research work. I am grateful for having the opportunity to work under her supervision.

Not to forget, I would also like to thank my co-supervisor, Associate Professor Dr Khairil Iskandar Othman, for his advices and assistance as well as for the endless support.

I am also indebted to the Ministry of Higher Education Malaysia and Universiti Teknologi MARA for the scholarship under Young Lecturer Scheme, providing the financial means which enables me to carry out this research.

Sincere thanks to all my friends especially Mahfuzah, Wan Rosanisah, and Rusliza for their kindness and moral support during my study. Thanks for the friendship and memories.

Finally, I would like to express my gratitude to my beloved parents, Mohd Isa Bin Ibrahim and Ruhana Binti Mohamad for their patience, understanding and endless love that have given me the willpower to complete this research. Hence, this thesis is dedicated to all those I have mentioned above, in no particular order.

Thank you.