SOLVING FIRST ORDER ORDINARY DIFFERENTIAL EQUATION USING HIGHER ORDER RUNGE – KUTTA METHOD

NUR ARDINI BINTI MOHAMAD TAUFIK
SHARIFAH HAZIRAH BINTI SYED BASRI

Thesis Submitted in Fulfillment of the Requirement for Bachelor of Science (Hons.) Computational Mathematics in the Faculty of Computer and Mathematical Sciences Universiti Teknologi MARA

July 2019

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.

NUR ARDINI BINTI MOHAMAD TAUFIK

2016299106

11 JULY 2019

SHARIFAH HAZIRAH BINTI SYED BASRI

2016284382

11 JULY 2019

ABSTRACT

Runge – Kutta method can be used to solve differential equation problem in the form of numerical method. Researchers have come out with many versions of Runge – Kutta method to increase its accuracy and efficiency. In this study, higher order Runge – Kutta method of RK 6 (Butcher – 1, Butcher – 2, Butcher – 3 and Luther), RK 7 and RK 8 are used to solve different ordinary differential equation problems with different step size. The numerical results are compared with theoretical solution in order to obtain accuracy and to determine the best method.

TABLE OF CONTENT

		Page
DECLARATION BY SUPERVISOR		i
DECLARATION BY CANDIDATE		ii
ABSTRACT		iii
ACKNOWLEDGEMENT		iv
LIST OF TABLE		v
LIST OF FIGURE		vii
LIST OF ALGORITHM		viii
LIST OF ABBREVIATION AND SYMBOL		ix
1.0	INTRODUCTION OF RESEARCH	1
1.1	Introduction	1
1.2	Background of Study	1
1.3	Problem Statement	3
1.4	Objectives	4
1.5	Significant of Project	4
1.6	Scope of Project	5
1.7	Project Benefits	6
1.8	Definition of Terms and Concepts	6
1.9	Literature Review	8
1.10	Organization of Report	11

2.0 METHODOLOGY 14

2.1 Introduction 14

2.2 Theoretical Solution of First Order ODE 14

2.2.1 First Order of Separable ODE 15

2.2.2 First Order of Linear ODE 15

2.2.3 First Order of Exact ODE 17

2.2.4 First Order of Homogenous ODE 19

2.2.5 First Order of Bernoulli's ODE 20

2.3 Numerical Solution of First Order ODE (Runge-Kutta Version) 21

2.3.1 Fundamental of Sixth order Runge-Kutta method 22

2.3.2 Fundamental of Seventh order Runge-Kutta method 26

2.3.3 Fundamental of Eighth order Runge-Kutta method 28

2.4 Research step 30

2.5 Conclusion 34

3.0 IMPLEMENTATION 35

3.1 Introduction 35

3.2 Sample of First Order ODE Problems 35

3.3 Theoretical Solution of First Order ODE Problems 36

3.3.1 Solution of First Order Linear ODE Problem 37

3.3.2 Solution of First Order Bernoulli's ODE Problem 40

3.3.3 Solution of First Order Separable ODE Problem 43