PERFORMANCE OF CLOSED NEWTON-COTES METHODS AND ALTERNATIVE EXTENDED SIMPSON'S RULE METHOD FOR SOLVING COMPLEX INTEGRATION FUNCTIONS

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ABSTRACT

In mathematics, numerical integration is particularly important. In this project, there are five numerical integration methods involved which come from Closed Newton-Cotes Methods (Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Boole's Rule) and Alternative Extended Simpson's Rule. The main goal of this research is to evaluate the effectiveness of Closed Newton-Cotes Methods and Alternative Extended Simpson's Rule. Based on error analysis and CPU time, the best method is chosen. The effective method will be determined based on the lowest percentage error and CPU times. The best method in total is determined based on the performance of percentage error. To choose the best method, the programme MATLAB R2022a is used, and the outcomes are compared. SigmaPlot 14.0 software has been included to display the performance profile of each method. In the end, it is emphasised that Simpson's 1/3 is the best method with subinterval of $n = 96$ in term of error analysis. While Alternative Extended Simpson's Rule with subinterval of $n = 12$ is the most effective method based on CPU Times performance.

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TABLE OF CONTENTS

DECLARATION BY THE SUPERVISOR iii

DECLARATION BY THE CANDIDATE iv

ABSTRACT v

ACKNOWLEDGEMENT vi

TABLE OF CONTENTS vii

LIST OF TABLES xi

LIST OF FIGURES xiii

INTRODUCTION OF RESEARCH 1

1.1 Introduction 1

1.2 Background of Study 1

1.3 Problem Statements 4

1.4 Objectives 6

1.5 Significance of the Project 6

1.6 Scope of the Project 7

1.7 Project Benefits 8

1.8 Definition of Terms and Concepts 9

1.9 Organization of Report 10

LITERATURE REVIEW 12

2.1 Introduction 12

2.2 Literature Review 12

2.3 Conclusion 18

METHODOLOGY 19

3.1 Introduction 19

3.2 Research Step 19

3.3 Preliminary Theory of Integration Function 23

3.3.1 Integration Equation 23

3.4 Interval and subinterval 27

3.5 Formula of numerical methods for solving integration Problem 24

3.6 Conclusion 27

IMPLEMENTATION 29

4.1 Introduction 29

4.2 List of functions 29

4.3 Implementation of Complex Integration functions 30

4.3.1 Implementation of Function 1 30

4.3.2 Implementation of Function 2 32

4.3.3 Implementation of Function 3 33

4.3.4 Implementation of Function 4 34

4.3.5 Implementation of Function 5 35