

## TABLE OF CONTENTS

| CHAPTER NO. | TITLE                                    | PAGE NO.    |
|-------------|--|-------------|
|             | <b>ABSTRACT</b>                          | <b>v</b>    |
|             | <b>LIST OF TABLES</b>                    | <b>xiii</b> |
|             | <b>LIST OF FIGURES</b>                   | <b>xiv</b>  |
|             | <b>LIST OF SYMBOLS AND ABBREVIATIONS</b> | <b>xv</b>   |
| <b>1</b>    | <b>INTRODUCTION TO SOFTWARE TESTING</b>  | <b>1</b>    |
| 1.1         | INTRODUCTION TO SOFTWARE<br>ENGINEERING  | 1           |
| 1.1.1       | SDLC phases                              | 1           |
|             | SDLC Phase- 1: Requirements Analysis     | 2           |
|             | SDLC Phase- 2: System Design             | 2           |
|             | SDLC Phase- 3: Code Implementation Phase | 2           |
|             | SDLC Phase- 4: Software Testing          | 3           |
| 1.2         | SOFTWARE TESTING AS A PROCESS            | 4           |
| 1.2.1       | Software Testing Life Cycle              | 6           |
| 1.2.2       | Manual Testing Vs Automation Testing     | 9           |
| 1.3         | FUNDAMENTALS OF SOFTWARE TESTING         | 12          |
| 1.3.1       | Software Test case                       | 12          |
| 1.3.2       | Role of a Smart Software Tester          | 13          |
| 1.3.3       | Software Testing in SQA                  | 14          |
| 1.3.4       | Testing Levels                           | 16          |
| 1.3.5       | Regression Testing                       | 19          |
| 1.4         | ISSUES IN SOFTWARE TESTING               | 20          |

| <b>CHAPTER NO.</b> | <b>TITLE</b>   | <b>PAGE NO.</b> |
|--------------------|--|-----------------|
| 1.5                | RESEARCH OBJECTIVES  | 24              |
| 1.6                | RESEARCH METHODOLOGY                                       | 25              |
|                    | 1.6.1 Test Suite Process Model                             | 25              |
|                    | 1.6.2 Test Suite Reduction and Optimization                | 27              |
|                    | 1.6.3 Data mining Concepts                                 | 28              |
|                    | 1.6.4 Machine Learning in Software Testing                 | 30              |
|                    | 1.6.5 Metaheuristics Algorithms                            | 33              |
| 1.7                | SUMMARY  | 35              |
| 1.8                | THESIS OVERVIEW  | 36              |
| <br>               |  |                 |
| <b>2</b>           | <b>LITERATURE SURVEY</b>                                   | <b>37</b>       |
| <br>               |  |                 |
| <b>3</b>           | <b>TEST SUITE REDUCTION USING TUNED FUZZY LOGIC</b>        | <b>56</b>       |
| 3.1                | INTRODUCTION   | 56              |
| 3.2                | TEST CASE CLASSIFICATION                                   | 57              |
|                    | 3.2.1 Attribute selection                                  | 57              |
| 3.3                | TEST CASE CLASSIFICATION USING REUSABILITY                 | 58              |
|                    | 3.3.1 Level 2 Test Case Classification                     | 61              |
| 3.4                | TEST SUITE REDUCTION USING FUZZY LOGIC                     | 62              |
|                    | 3.4.1 Architecture of Proposed System                      | 62              |
|                    | 3.4.2 Basic Fuzzy model and Fuzzy set                      | 63              |
|                    | 3.4.3 Tuned Fuzzy Logic Model                              | 65              |
|                    | 3.4.4 Tuned Fuzzy logic Algorithm for test suite reduction | 70              |

| <b>CHAPTER NO.</b> | <b>TITLE</b>  | <b>PAGE NO.</b> |
|--------------------|---|-----------------|
|                    | 3.4.5 Illustration of Experiment                                      | 72              |
| 3.5                | PERFORMANCE ANALYSIS  | 77              |
|                    | 3.5.1 Comparison with BOG and HGS                                     | 79              |
| 3.6                | SUMMARY   | 83              |
| <b>4</b>           | <b>TEST SUITE OPTIMIZATION USING FINE<br/>TUNED FIREFLY ALGORITHM</b> | <b>85</b>       |
| 4.1                | FIREFLY ALGORITHM   | 85              |
| 4.2                | MACHINE LEARNING FOR TEST<br>CASES IDENTIFICATION                     | 86              |
| 4.3                | ‘AGE’ ATTRIBUTE AND TEST<br>CASE CLASSIFICATION                       | 87              |
| 4.4                | ‘VERSIONS’ ATTRIBUTE AND TEST<br>CASE CLASSIFICATION                  | 88              |
| 4.5                | ‘REUSABILITY’ OF A TEST CASE  | 90              |
|                    | 4.5.1 Optimizing ‘Reusability’ using Fine<br>Tuned Firefly Algorithm  | 92              |
| 4.6                | PERFORMANCE ANALYSIS  | 96              |
| 4.7                | TOOLS USED FOR EXPERIMENTS  | 99              |
|                    | 4.7.1 TCO Tool  | 99              |
|                    | 4.7.2 About the Dataset   | 101             |
|                    | 4.7.3 JUnit Testing Tool  | 103             |
|                    | 4.7.4 Time and Space Complexity of Algorithm                          | 104             |
|                    | 4.7.5 Results Evaluation  | 105             |
| 4.8                | SUMMARY   | 111             |

| <b>CHAPTER NO.</b> | <b>TITLE</b>   | <b>PAGE NO.</b> |
|--------------------|--|-----------------|
| <b>5</b>           | <b>OPTIMIZING TEST CASE REPOSITORY<br/>USING REUSABILITY FRAMEWORK</b> | <b>112</b>      |
| 5.1                | INTRODUCTION   | 112             |
| 5.1.1              | Performance by optimizing Test Case<br>Repository                      | 116             |
| 5.2                | SUMMARY  | 117             |
| <b>6</b>           | <b>CONCLUSION AND FUTURE WORKS</b>                                     | <b>118</b>      |
| 6.1                | FUTURE WORKS   | 120             |
|                    | <b>REFERENCES</b>  | <b>121</b>      |
|                    | <b>LIST OF PUBLICATIONS</b>  | <b>126</b>      |