**CONTENTS**

|  |  |  |
| --- | --- | --- |
| **S.NO** | **TITLE** | **PAGE NO.** |
|  | Acknowledgements | iv |
|  | Abstract | v |
|  | List of Abbreviations | viii |
|  | List of Figures | ix |
|  | List of Tables | x |
| **Chapter 1** | **Significance of Basics of Power Systems** | **1-5** |
| 1.1 | Introduction | 1 |
| 1.2 | Basics of Power Systems | 2 |
| 1.3 | Power Transmission Lines | 3 |
| 1.4 | Problem Statement | 4 |
| **Chapter 2** | **Background and Related Work** | **6-15** |
| 2.1 | Introduction | 6 |
| 2.2 | Faults on Transmission Lines | 6 |
|  | 2.2.1 Series Faults | 6 |
|  | 2.2.2 Shunt Faults | 6 |
| 2.3 | Causes of Electric Faults | 8 |
| 2.4 | Literature Survey | 9 |
| 2.5 | Survey of Method | 13 |
|  | 2.5.1 Fault Classification Techniques | 13 |
|  | 2.5.2 Fault Location Identification Techniques | 14 |
| 2.6 | Performance Measures | 15 |
| **Chapter 3** | **Machine Learning** | **16-26** |
| 3.1 | Introduction | 16 |
| 3.2 | Artificial Neural Networks | 17 |
|  | 3.2.1 Importance and Learning Techniques of ANN | 20 |
|  | 3.2.2 Characteristics of ANN | 21 |
|  | 3.2.3 Advantages and Disadvantages of ANN | 21 |
| 3.3 | Deep Neural Network | 23 |
| 3.4 | Recurrent Neural Networks | 24 |
| **Chapter 4** | **Simulations** | **27-33** |
| 4.1 | Tools Used | 27 |
|  | 4.1.1 MATLAB/SIMULINK | 27 |
|  | 4.1.2 NeuroSolutions | 28 |
| 4.2 | Data Generation | 28 |
| 4.3 | Training Network | 29 |
|  | 4.3.1 Fault detection and classification | 30 |
|  | 4.3.2 Fault location identification | 31 |
| 4.4 | Testing network | 31 |
|  | 4.4.1 Fault detection and classification | 32 |
|  | 4.4.2 Fault location identification | 33 |
| **Chapter 5** | **Results and Discussions** | **34-37** |
| 5.1 | Results | 34 |
| 5.2 | Application of Proposed Methods in Smart Grids | 34 |
| 5.3 | Conclusions | 35 |
| 5.4 | Future Scope | 36 |
| 5.5 | Finance and Project Management | 36 |
|  | 5.5.1 Hardware | 36 |
|  | 5.5.2 Software | 36 |
|  | 5.5.3 Time Management | 37 |
|  | 5.5.4 Societal and Environmental Impact | 37 |
|  | **References** | **38** |