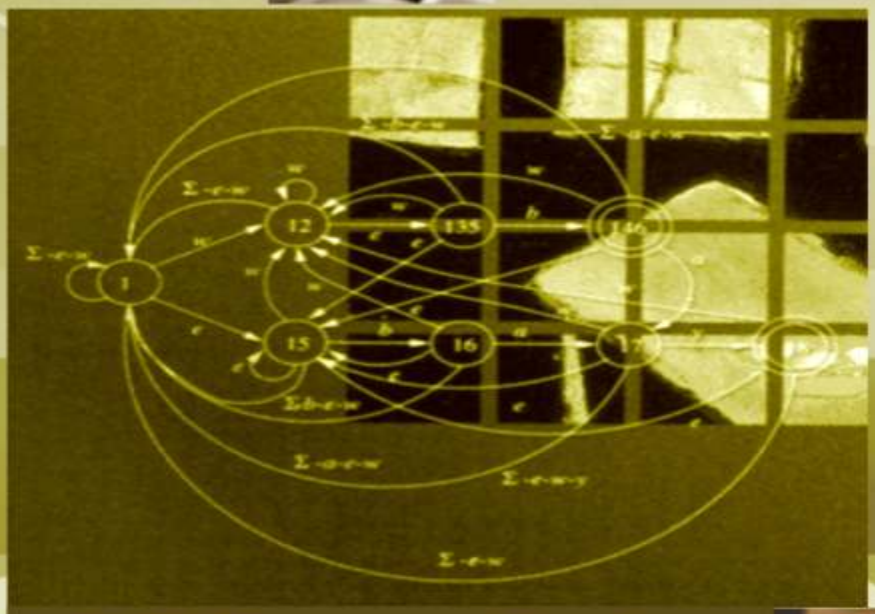
NEW AGE

THEORY OF AUTOMATA, FORMAL LANGUAGES AND COMPUTATION



S.P. Eugene Xavier

NEW AGE INTERNATIONAL PUBLISHERS

Theory of AUTOMATA, FORMAL LANGUAGES and COMPUTATION

S.P. Eugene Xavier

PUBLISHING FOR ONE WORLD

NEW AGE INTERNATIONAL (P) LIMITED, PUBLISHERS

New Delhi • Bangalore • Chennai • Cochin • Guwahati • Hyderabad
Jalandhar • Kolkata • Lucknow • Mumbai • Ranchi

Visit us at **www.newagepublishers.com**

Published by New Age International (P) Ltd., Publishers

ISBN (10) : 81-224-2334-5

ISBN (13) : 978-81-224-2334-1

PUBLISHING FOR ONE WORLD

NEW AGE INTERNATIONAL (P) LIMITED, PUBLISHERS
4835/24, Ansari Road, Daryaganj, New Delhi - 110002
Visit us at **www.newagepublishers.com**

This book is dedicated to
My Beloved Father, Mother, Wife and Daughter —
The Fountain of Inspiration Forever

THIS PAGE IS BLANK

Preface

This book deals with a fascinating and important subject which has the fundamentals of computer hardware, software and some of their applications. This book is intended as an introductory graduate text in computer science theory. I have taken care to present the material very clearly and interestingly.

As an introductory subject to computer science, this book has been written with major stress on worked examples. **Chapter 0** covers the basics required for this subject *viz*., sets, relations, functions, graphs, trees, languages, and fundamental proof techniques.

Chapter 1 deals with the different aspects of Deterministic Finite Automata (DFA) and Non-Deterministic Finite Automata (NFA). A brief introduction to pumping lemma and some theorems relating to Regular Sets have also been given.

Chapter 2 covers the concepts relating to context free grammar *viz*., derivation trees, parsing, ambiguity, and normal forms. **Chapter 3** deals with Pushdown Automata and their relation to Context-Free Grammar with some introduction to decision algorithms.

Chapter 4 deals with the Turing Machine model and the variations of Turing Machines with introduction to Church-Turing Thesis and the concept of undecidability. **Chapter 5** explains the concepts *viz*., regular grammars, unrestricted grammars and Chomsky hierarchy of languages.

Chapter 6 deals with the different aspects of computability with an introduction to formal systems, recursive functions, primitive recursive functions, and recursion. **Chapter 7** covers the various aspect of complexity theory such as polynomial time algorithms, non-polynomial time algorithm class P and NP problems.

Chapter 8 covers propositions and predicates with lot of illustrative examples.

I wish to thank my teachers who helped me to get a good grasp of the subject and for having motivated me to write this book.

I want to place on record my sincere thanks to my family—Shri. Papu Antony, my father; Mrs. Maria Daisy, my mother; Mrs. Assumpta Eugene, my wife; and Ms. E. Catherine Praveena, my only daughter, for their great patience and prayers while I was writing this book.