Preface

Graph Theory has become an important discipline in its own right because of its applications to Computer Science, Communication Networks, and Combinatorial optimization through the design of efficient algorithms. It has seen increasing interactions with other areas of Mathematics. Although this book can ably serve as a reference for many of the most important topics in Graph Theory, it even precisely fulfills the promise of being an effective textbook. The main attention lies to serve the students of Computer Science, Applied Mathematics, and Operations Research ensuring fulfillment of their necessity for Algorithms. In the selection and presentation of material, it has been attempted to accommodate elementary concepts on essential basis so as to offer guidance to those new to the field. Moreover, due to its emphasis on both proofs of theorems and applications, the subject should be absorbed followed by gaining an impression of the depth and methods of the subject. This book is a comprehensive text on Graph Theory and the subject matter is presented in an organized and systematic manner. This book has been balanced between theories and applications. This book has been organized in such a way that topics appear in perfect order, so that it is comfortable for students to understand the subject thoroughly. The theories have been described in simple and clear Mathematical language. This book is complete in all respects. It will give a perfect beginning to the topic, perfect understanding of the subject, and proper presentation of the solutions. The underlying characteristics of this book are that the concepts have been presented in simple terms and the solution procedures have been explained in details.

This book has 10 chapters. Each chapter consists of compact but thorough fundamental discussion of the theories, principles, and methods followed by applications through illustrative examples.

All the theories and algorithms presented in this book are illustrated by numerous worked out examples. This book draws a balance between theory and application.

Chapter 1 presents an Introduction to Graphs. Chapter 1 describes essential and elementary definitions on isomorphism, complete graphs, bipartite graphs, and regular graphs.

Chapter 2 introduces different types of subgraphs and supergraphs. This chapter includes operations on graphs. Chapter 2 also presents fundamental definitions of walks, trails, paths, cycles, and connected or disconnected graphs. Some essential theorems are discussed in this chapter.

Chapter 3 contains detailed discussion on Euler and Hamiltonian graphs. Many important theorems concerning these two graphs have been presented in this chapter. It also includes elementary ideas about complement and self-complementary graphs.

Chapter 4 deals with trees, binary trees, and spanning trees. This chapter explores thorough discussion of the Fundamental Circuits and Fundamental Cut Sets.

Chapter 5 involves in presenting various important algorithms which are useful in mathematics and computer science. Many are particularly interested on good algorithms for shortest path problems and minimal spanning trees. To get rid of lack of good algorithms, the emphasis is laid on detailed description of algorithms with its applications through examples which yield the biggest chapter in this book.

The mathematical prerequisite for Chapter 6 involves a first grounding in linear algebra is assumed. The matrices incidence, adjacency, and circuit have many applications in applied science and engineering.

Chapter 7 is particularly important for the discussion of cut set, cut vertices, and connectivity of graphs.

Chapter 8 describes the coloring of graphs and the related theorems.

Chapter 9 focuses specially to emphasize the ideas of planar graphs and the concerned theorems. The most important feature of this chapter includes the proof of Kuratowski's theorem by Thomassen's approach. This chapter also includes the detailed discussion of coloring of planar graphs. The Heawood's Five color theorem as well as in particular Four color theorem are very much essential for the concept of map coloring which are included in this chapter elegantly.

Finally, Chapter 10 contains fundamental definitions and theorems on networks flows. This chapter explores in depth the Ford–Fulkerson algorithms with necessary modification by Edmonds–Karp and also presents the application of maximal flows which includes Maximum Bipartite Matching.

Bibliography provided at the end of this book serves as helpful sources for further study and research by interested readers.

http://www.springer.com/978-81-322-0749-8

Graph Theory with Algorithms and its Applications
In Applied Science and Technology
Saha Ray, S.
2013, XVI, 216 p., Hardcover
ISBN: 978-81-322-0749-8