ΔΙΑΚΡΙΤΑ ΜΑΘΗΜΑΤΙΚΑ

Προπτυχιακό Εγχειρίδιο

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Abstract

This book offers a comprehensive analysis of the topic of Discrete Mathematics from the perspective of Theoretical Computer Science. The Chapter 1 is an introduction. The Chapter 2 examines "Elements of Propositional Logic," including concepts such as mathematical propositions and propositional types. The Chapter 3 is dedicated to "Elements of Predicate Logic," addressing topics such as syntax and the structure of first-order language and semantic approaches. In the Chapter 4, "Sets and Enumeration Methods," fundamental concepts of sets are analyzed, including enumeration methods and non-computability. This is followed by the Chapter on "Relations," covering topics such as basic definitions, representation of relations, properties of binary relations, and equivalence relations. The following Chapters include the "Proof Techniques" chapter, presenting proof techniques such as proofs of existence,

Pigeonhole principle and mathematical induction. The Chapters on "Graph Theory" and "Trees" provide the reader with terminology, definitions, and characteristics of the respective topics. Next follows the Chapter on "Enumerative Combinatorics" analyzing principles such as inclusion-exclusion, the product-sum rule, and other combinatorial concepts. The Chapters on "Generating Functions" and "Recurrence Relations" examine basic properties and relevant applications, such as computing sums, using generating functions to solve combinatorial problems, and solving non-recursive relations, among others. The book concludes with the Chapter on "Number Theory," covering topics such as divisibility, the Greatest Common Divisor, and Group Theory. Each chapter contributes equally to the overall understanding of the content, providing a comprehensive introductory journey into the field of Discrete Mathematics.