Discrete Structures

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Text book

Discrete Mathematics and Its Application, 7th Edition

Kenneth H. Rosen

References

Chapter 1

1. Discrete Mathematics and Its Application, 7th Edititon

By Kenneth H. Rose

2. Discrete Mathematics with Applications

By Thomas Koshy

These slides contain material from the above two books.

Grading breakup

I. Midterm = 25 points
II. Final term = 35 points
III. Quizzes = $2.5 \times 8 = 20$ points (A total of 8 quizzes)
IV. Assignments = 1.25 × 4 = 5 points (A total of 4 assignments)
V. Presentations = 5 points.

Discrete mathematics

Discrete mathematics is the part of mathematics devoted to the study of **discrete objects**. (Here discrete means consisting of distinct or unconnected elements.)

Much of **discrete mathematics** is devoted to the study of **discrete structures**, used to represent **discrete objects**.

Discrete structures include **sets, permutations, relations, graphs, trees,** and **finite-state machines**.

What kind of problems solved?

The kinds of problems solved using discrete mathematics include:

- How many ways are there to choose a **valid password** on a computer
- What is the probability of **winning a lottery**?
- Is there a link between **two computers** in a **network**?
- How can I identify **spam e- mail messages**?
- How can I **encrypt a message** so that no unintended recipient can read it?

What kind of problems solved?

- How can a list of **integers be sorted** so that the integers are in increasing order?
- How many **steps are required** to do such a sorting?
- How can it be proved that a sorting algorithm **correctly sorts** a list?
- How can a **circuit** that adds two integers be designed?
- How many valid **Internet addresses** are there

Why study discrete mathematics?

- **You can develop your mathematical maturity:** that is, your ability to **understand** and create **mathematical arguments**.

- You will not get very far in your studies in the **mathematical sciences** without these **skills**.

Why study discrete mathematics?

- **Second, discrete mathematics is the gateway** to more **advanced courses** in all parts of the mathematical sciences.

- **Discrete mathematics** provides the mathematical foundations for many **computer science courses** including

  data structures, algorithms, database theory, automata theory, formal languages, compiler theory, computer security, and operating systems

Logic

Logic is the study of **methods and principles** of reasoning in all its possible form.

OR

It is the basis of **mathematical reasoning**.

OR

It is the study of the principles and methods that distinguishes between a **valid** and **invalid arguments**.

Logic

Logic has numerous applications in computer science. These rules are used in the design of **computer circuits**, the **construction of computer programs**, the verification of the **correctness of programs**, and in many other ways.

Suggested Readings

- **1.1 Propositional Logic**