

## KEY TOPICS FOR UPCOMING EXAM FALL 24 (DS-BSCS 3J-3H)

### **1 The Foundations: Logic and Proofs**

- 1.3 Propositional Equivalences ..
- 1.4 Predicates and Quantifiers ...
- 1.5 Nested Quantifiers .....
- 1.6 Rules of Inference .....
- 1.7 Introduction to Proofs .....

### **2 Basic Structures: Sets, Functions, Sequences, Sums, and Matrices .....**

- 2.3 Functions .....
- 2.4 Sequences and Summations .

### **4 Number Theory and Cryptography .**

- 4.3 Primes and Greatest Common Divisors ..
- 4.4 Solving Congruences .....
- 4.5 Applications of Congruences .....
- 4.6 Cryptography .....

### **5 Induction and Recursion .**

- 5.1 Mathematical Induction
- 5.3 Recursive Definitions and Structural Induction .

### **6 Counting ..**

- 6.2 The Pigeonhole Principle .....
- 6.3 Permutations and Combinations .....
- 6.4 Binomial Coefficients and Identities .

### **8 Advanced Counting Techniques**

- 8.2 Solving Linear Recurrence Relations
- 8.5 Inclusion–Exclusion .

## **9 Relations .**

9.1 Relations and Their Properties .

9.5 Equivalence Relations .

## **10 Graphs .**

10.1 Graphs and Graph Models . . . . .

10.2 Graph Terminology and Special Types of Graphs

10.3 Representing Graphs and Graph Isomorphism . . .

10.4 Connectivity . . . . .

10.5 Euler and Hamilton Paths . . . . .

10.6 Shortest-Path Problems . . . . .

10.7 Planar Graphs . . . . .

10.8 Graph Coloring . . . . .

## **11 Trees .**

11.1 Introduction to Trees . . . . .

11.2 Applications of Trees . . . . .

11.3 Tree Traversal . . . . .

11.4 Spanning Trees . . . . .

11.5 Minimum Spanning Trees

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