Study Guide for the Mid-Term Exam
CS-227, Spring 2009

NOTE that the material presented here is intended to assist you in your review and study of the course material. Overall, you are responsible for:

- All of the material in the assigned readings, whether or not it was covered in class.
- All of the material in the assigned homework problems.
- All of the material that was covered in class, whether or not it was also included in the assigned readings.

Logic and Proofs

1. Propositional Logic (Rosen's Section 1.1)
    a. Operations:
        i. Conjunction (logical AND)
        ii. Disjunction (logical OR – *i.e.*, inclusive OR)
        iii. Exclusive OR
        iv. Conditional Statements (Implication)
        v. Biconditional
    b. Alternative notations
    c. Truth Tables (Tables 1 through 6 and Table 8 in Section 1.1)
        NOTE that I require that your Truth Tables be written with zeroes and ones in place of F's and T's, and that the rows be in lexicographic order.
    d. Logic Puzzles

2. Propositional Equivalence (Rosen's Section 1.2): Proof of equivalence via Truth Table

3. Predicates, Propositional Functions, and Quantifiers (Rosen's Section 1.3)
    a. Universal Quantifier
    b. Existential Quantifier
    c. Negation of a Quantified Expression

4. Validity of Arguments, Rules of Inference, and Fallacies (Rosen's Section 1.5)
    a. Table 1 on page 66

5. Proofs (Rosen's Section 1.6)
    a. Terminology:
        i. Axiom or Postulate
        ii. Proposition
        iii. Theorem
        iv. Lemma
        v. Corollary
        vi. Conjecture
        vii. Converse
        viii. Inverse
        ix. Contrapositive
    b. Direct Proof
    c. Indirect Proof
    d. Proof by Contraposition
    e. Proof by Contradiction

Basic Structures: Sets, Functions, Sequences, and Sums

6. Sets (Rosen's Section 2.1): DEFINITIONS and NOTATION
    a. Set
    b. Subset
    c. Proper Subset
    d. Power Set

7. Set Operations (Rosen's Section 2.2)
    a. Union
    b. Intersection
    c. Cartesian Product
    d. Venn Diagram
    e. Set Identities (Table 1 on page 124)
    f. Principle of Inclusion-Exclusion

8. Functions (Rosen's Section 2.3)
    a. Definition of FUNCTION
    b. One-to-One (Injective)
    c. Onto (Surjective)
    d. One-to-One Correspondence (Bijective)
    e. Increasing and Strictly Increasing
    f. Decreasing and Strictly Decreasing
    g. Invertible Function
    h. Composition of Functions
    i. Graph of a Function
    j. Special Functions:
        i. Floor Function
        ii. Ceiling Function
        iii. Factorial

9. Sequences and Summations (Rosen's Section 2.4)
    a. Sequence: DEFINITION
    b. Geometric Progression
    c. Arithmetic Progression
    d. Special Integer Sequences
    e. Summations
    f. Cardinality
    g. Countability and Uncountablility of an infinite set