CS113 – Final Review for Final Exam

Vocabulary—Know all vocabulary discussed in the class
You can look at the study guides for the previous exams for vocabulary lists. I won't ask you to define or explain terms, but I will expect you to know what they mean,

Truth tables and Logic
Know about truth tables and be able to create one, either to tell the truth value of a logical expression or to determine if two expressions are logically equivalent. Know the truth value of the basic logical operators: and, or, not, implies, iff.

For the converse, inverse, contrapositive, biconditional, be able to determine this from an original proposition and be able to state the truth value.

General Methods of Proof
Be able to use the three methods (direct proof, indirect proof, proof by contrapositive) to prove something.

Be able to determine whether two propositions are equivalent or not.

Mathematical induction
Be able to prove a statement using mathematical induction. The proof has to be clear, correctly indicating and displaying the base and inductive steps.

Set operations
Be able to work with sets. This means being able to find the union, intersection, set difference of two sets. Be able to find the power set of a set. Be able to use the symbols $\in$ and $\subseteq$ correctly.
Be able to use the three rules we had.

$$x \in A \cap B \rightarrow x \in A \text{ and } x \in B$$
$$x \in A \cup B \rightarrow x \in A \text{ or } x \in B$$
$$A \subseteq B \rightarrow (x \in A \rightarrow x \in B)$$
$$A = B \rightarrow A \subseteq B \text{ and } B \subseteq A$$
$$x \in \overline{A} \rightarrow x \notin A$$

Venn Diagrams
Given a universal set, be able to draw a Venn diagram and use it to get information.

Math in various bases.
Be able to convert numbers between bases (2, 10, 16.) and be able to add binary numbers

Relations
Given a relation, be able to determine if it's an equivalence relation or not. If it is an equivalence relation, be able to find the equivalence classes

Functions
Know that if there is a bijection (1-1 and onto function) between two sets they are the same "size" ("have the same cardinality")

Counting
Be able to count the number of ways something can happen.
Know the notation and what it means: P(n,r), C(n,r)

Be able to use Pascal's triangle and/or the definition of the combinatorial coefficients and/or the Binomial Theorem to verify combinatorial identities.

Probability
General note: When writing an answer giving a probability, be sure to write P(some event) = …
The probability of an event is defined to be $$P(E) = \frac{|E|}{|S|}$$
Also, be able to use the Complement Rule. (Theorem 4.5.5) and the Addition Rule (Theorem 4.5.9)

Be able to use the Conditional Probability Rule (Definition 4.5.13) It has two uses. One is to calculate conditional probabilities. The other is to see if two events are independent or not

Recurrence Relations
Be able to solve a recurrence relation using iteration. Also, be able to solve a linear recurrence relation with constant coefficients. We can solve those if they are homogeneous or have a polynomial in n on the right side. You will be given the tables from the book for the non-homogeneous recurrence relations on the test (those like p. 244, #41-46)

Be able to convert a word problem into a recurrence relation and then to solve the recurrence relation.

Graphs
Be able to draw Kn and Kn,m.
Be able to determine if a cycle is an Euler cycle or a Hamiltonian cycle. Be able to determine if a graph has an Euler cycle.
Be able to create an adjacency and/or an incidence matrix for a given graph.
Be able to tell if two graphs are isomorphic.
If a graph is planar, be able to verify Euler's formula. (Memorize it first!)
Note: Euler's formula only applies to connected planar graphs.
Know what a Gray code is. Be able to write one using n bits.

Trees
Be able to list the nodes in a preorder, inorder, postorder traversal of a given tree.
Know the four equivalent conditions in Theorem 7.2.3.