Material from Lectures 7 through 10. Updated November 24, 2000 The final exam is cumulative. However, it will emphasize material that has been covered since Test 2.

1. Combinatorics
   (a) Understand and use the addition rule and the multiplication rule.
   (b) Understand and use the principle of Inclusion-Exclusion (see problem set).
   (c) Use permutations and combinations to count sets of arrangements with repetition and without repetitions and to count selections with and without repetition (see problem set).
   (d) Use Polya's block walking model to count paths.
2. Probability
   (a) Definitions of Sample space, Event, Outcome, Equally likely probability measure.
   (b) Understand and use principles of combinatorics to compute probabilities.
   (c) Use Pascal's triangle (binomial coefficients) to find probabilities associated with binomial experiments.
3. Relations
   (a) Know definitions of all the properties of relations that we studied: reflexivity, symmetry, antisymmetry, transitivity, equivalence relation, partially ordered set, linearly ordered set, etc.
   (b) Given a relation in one of its three forms orders pairs, digraph, boolean matrix, determine the other two forms.
   (c) Given a relation tell which of the properties it has.
   (d) Given a set, tell how many relations on the set have various properties or combinations of properties.
   (e) Prove simple propositions about the union and the intersection of relations with certain properties. For example, the union of two symmetric relations is symmetric.
4. Graphs (this topic was not covered in the Fall 2000)
   (a) Definitions of Eulerian graphs, connectivity, vertex degrees, Hamiltonian.

(b) Use the theorem in class to determine which graphs are Eulerian. Apply this to the problem of using all the doors in a house exactly once.

(c) Use ad hoc methods to determine if a graph is Hamiltonian.

5. Digraphs

(a) Understand and make use of the relationships among the three models of a relation: the set (of ordered pairs) model, the boolean matrix model, and the digraph model. (See relations above.)

(b) Definitions of in degree and out degree, connectedness, transitive closure.

(c) Find the transitive closure, symmetric closure, etc. of a relation.

(d) Construct the Hasse diagram of a relation.