Final Topics CS220

Propositional & Predicate Logic
   Definition of a proposition
   Definition of a predicate
   Logic operators
   Truth table, tautology, contingency, & contradiction
   Universal quantifier, Existential quantifier
   Equivalences involving negation of universal and existential quantifiers

 Rules of Inferences
   Definition of rules of inference
   Use truth tables to determine if a rule of inference is valid or not valid
   Be able to derive a conclusion by applying rules of inferences to the premises

 Proof techniques
   Direct Proofs
       Definition of a direct proof
       Be able to prove statement using direct proof technique
   Indirect Proofs
       Contraposition
           Know the principles behind a contraposition proof
           Be able to prove statement using contraposition proof
       Contradiction
           Know the principles behind a contradiction proof
           Be able to prove statement using contradiction proof
   Proof by cases
       Know the principle behind proof by cases
       Be able to prove statement using proof by cases

Program Correctness
   Pre and post conditions
   Loop invariants
      Proof rule for while loops

Sets & Functions
   N, Z, Q, R
   Sets: equivalence, union, intersection, difference, universal set
   Cardinality
   Subsets and Proper Subsets
   Tuples
   Cartesian product
   Power set
   Function
       Definition
       Injection, surjection, bijection
       Composition, inverse

Sequences
   Definitions, geometric Series, arithmetic series

Induction
 Linear induction
 Strong Induction
 Structural Induction

Counting
 Product rule, sum rule
 Permutations, combinations
 Inclusion / exclusion
 k to 1 rule, bijection rule
 Pigeonhole principle

Orders of Magnitude
 O of functions
 constant, log, sqrt, linear, polynomial, exponential
 O of programs, loops, recursion

Relations, binary relations, graph representation, partial orders and directed graphs
Graphs
 traversals, DFS, cycles, BFS, distance, paths, shortest paths, exchange argument,
 (minimum) spanning trees, shortest paths, shortest path trees