

CSE321 Exam 2 Review
June 5, 2003

The following is a list of topics that are fair game for the final.

Induction - weak and strong proofs dealing with:

- Euclid's algorithm
- trees
- strings
- recursive definitions

Counting

- permutations
- combinations
- probability

Relations

- reflexivity, symmetry, transitivity, antisymmetry
- equivalence relations / equivalence classes
- partitions

Graphs

- degree
- subgraphs
- paths, connectivity
- circuit
- edge-simple, vertex-simple
- Euler paths and circuits
- Hamiltonian paths and circuits
- planar graphs: $r = e - v + 2$, $e \leq 3v - 6$

Sample Problems:

1. Prove that every amount of postage of 12 cents or more can be formed using just 4-cent and 5-cent stamps:
 - (a) by strong induction.
 - (b) by weak induction.
2. This question deals with the probability of choosing a random string of 10 bits having a substring of at least 5 consecutive zeros.
 - (a) Why is the probability not equal to the number of places to put a string of 5 zeros times the number of for the other bits, divided by the total number of 10 bit strings, or $6 * 2^5 / 2^{10}$?
 - (b) What is the probability? (This is a harder question than what you will see on the final.)
3. We define a relation R over a graph $G = (V, E)$ as uRv iff. $u, v \in V$ and there is a path in G from u to v .
 - (a) Is R a reflexive, symmetric, and/or transitive relation if G is an arbitrary undirected graph?
 - (b) Is R a reflexive, symmetric, and/or transitive relation if G is an arbitrary directed graph?
 - (c) Do equivalence classes exist for (a) and (b), and if so describe them.
4. Suppose that a connected bipartite planar simple graph has e edges and v vertices. Show that $e \leq 2v - 4$ if $v \geq 3$. Use this to show that $K_{3,3}$ is not planar.
5. Give an example of a relation that is:
 - (a) symmetric and antisymmetric
 - (b) neither symmetric nor antisymmetric
6. A chip has 5 identical components each with 20% failure rate. The chip fails if at least 2 components fail. What is probably that the chip fails?