

CS 482 Summer 2004  
**Prelim 2 Review Suggestions**

## Suggested Review Questions

The following are a few questions we recommend for review. They are neither sufficient nor necessary for studying for the prelim. We won't be posting solutions for these problems, but you are more than welcome to drop by office hours or the review session to ask about them. You can also ask us about any other question in the text (of which there are muchos *many*) and we can help you out.

**General Flow Question** Ch. 7 Qn. 12

**Cut Application** Ch. 7 Qn. 46 (!!)

**Flow Application** Ch. 7 Qn. 16

**NP-Complete Proof** Ch. 8 Qn. 7

**NP-Complete Proof** Ch. 8 Qn. 17

**NP-Complete Proof** Ch. 8 Qn. 5

## NP-Complete Problems You Are Responsible For

The following are the NP-Complete problems you are responsible for knowing for the prelim. They are problems we have either covered in class or assigned on homeworks. You don't necessarily have to know the reductions used to show these are hard, but you should understand the definition of each problem, especially what the inputs and outputs are.

**3-SAT** Given a set of clauses  $C_1, \dots, C_k$ , each of length 3, over a set of variables  $\{x_1, \dots, x_n\}$ , does there exist a satisfying truth assignment?

**3-COL** Given a graph  $G$ , does a 3-colouring exist?

**k-COL** Given a graph  $G$ , does a k-colouring exist?

**VERTEX COVER** Given a graph  $G$  and a number  $k$ , does  $G$  contain a vertex cover of size at most  $k$ ?

**INDEPENDENT SET** Given a graph  $G$  and a number  $k$ , does  $G$  contain an independent set of size at least  $k$ ?

**DOMINATING SET** Given a graph  $G$  and a number  $k$ , does  $G$  contain a dominating set of size at most  $k$ ?

**CLIQUE** Given a graph  $G$  and a number  $k$ , does  $G$  contain a clique of size at least  $k$ ?

**HAMILTONIAN PATH** Given a directed (or undirected) graph  $G$ , does it contain a Hamiltonian path?

**HAMILTONIAN CYCLE** Given a directed (or undirected) graph  $G$ , does it contain a Hamiltonian cycle?

**LONGEST PATH** Given a directed (or undirected) graph  $G$  and a number  $k$ , does there exist a simple path of length at least  $k$ ?

**SET COVER** Given a set  $U$  of  $n$  elements, a collection  $S_1, \dots, S_m$  of subsets of  $U$ , and a number  $k$ , does there exist a collection of  $\leq k$  of these sets whose union is equal to all of  $U$ ?

**KNAPSACK/SUBSET SUM** Given natural numbers  $w_1, \dots, w_n$  and a target number  $W$ , is there a subset of  $\{w_1, \dots, w_n\}$  that adds up to precisely  $W$ ?

**3D-MATCHING** Given disjoint sets  $X, Y$ , and  $Z$ , each of size  $n$ ; and given a set  $T \subseteq X \times Y \times Z$  of ordered triples, does there exist a set of  $n$  triples in  $T$  so that each element of  $X \cup Y \cup Z$  is contained in exactly one of these triples?

## Review Session

We'll be holding a review session on Tuesday night, 7-8pm. The room will be Upson 215 or around there somewhere.

The review session will be for you to ask questions. In particular, we're not going to prepare any sort of review material, so please come armed with questions.

And last but not least, *be on time* and GOOD LUCK!