

Due Date: Thursday, April 26, 2012

1 Polynomial time algorithm for 2-SAT (25 points)

In 2SAT problem, the input is a set of clauses, each of which is a disjunction of exactly *two* literals. Design a polynomial time algorithm for 2SAT problem.

2 NP-Completeness, DPV 8.8 (25 points)

In the EXACT 4SAT problem, the input is a set of clauses, each of which is a disjunction of exactly four literals, and such that each variable occurs at most once in each clause. The goal is to find a satisfying assignment, if one exists. Prove that EXACT 4SAT is NP-complete.

3 More on NP-Completeness, DPV 8.19 (25 points)

A *kite* is a graph on an even number of vertices, say $2n$, in which n of the vertices form a clique and the remaining n vertices are connected in a tail that consists of a path joined to one of the vertices of the clique. Given a graph and a goal g , the KITE problem asks for a subgraph which is a kite and which contains $2g$ nodes. Prove that KITE is NP-complete.

4 Approximation algorithms (25 points)

Given a graph $G = (V, E)$, give $\frac{1}{d}$ -approximation algorithm for the Maximum Independent set problem, where d maximum degree of any vertex in the graph.