BU CLA CS 530: Analysis of Algorithms

Spring 1999

Problem Set 13

Due Thursday April 22, by 5:00 pm, in my mailbox in the main office of the CS department. Late submissions not accepted.

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1. Consider the following problem — call it VCIS (for "vertex-cover and independent set"):

   > Given an undirected graph $G = (V, E)$, determine whether there is a set of vertices $U \subseteq V$ which is both a vertex cover and an independent set, and if such a set U exists, find one which has minimum size.

   Is VCIS NP-hard? If yes, prove it. If no, design a polynomial-time algorithm to solve it.

   Hint: If $G = (V, E)$ is a triangle, there is no $U \subseteq V$ which is both a vertex cover and an indpendent set. If $G = (V, E)$ is a rectangle, two diagonally-opposed vertices are both a vertex cover and an independent set.

2. Show that the Traveling-Salesman Problem (TSP) remains NP-complete if we restrict the cost function to satisfy the triangle inequality. The "triangle inequality" is defined on page 969, in [CLR].

3. Exercise 37.2-1, page 973, in [CLR].
   Hint: Let the solution of the preceding exercise inspire you.

4. Exercise 37.3-2, page 978, in [CLR].

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