Introduction to Algorithms

Assignment 6
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Due: 27-APR-2009

Problem 1. Read about the dynamic programming based algorithms of all-pairs-shortest paths from the textbook.

Take a graph of about 5 vertices and show the working of both the algorithms. Show all your work.
(10 Points)

Problem 2. How can the output of the Floyd-Warshall algorithm be used to detect the presence of a negative weight cycle?
(10 Points)

Problem 3. Prove or disprove: If an edge (u, v) is contained in some minimum spanning tree, then it is a light edge crossing some cut of the graph. **(10 Points)**

Problem 4. Prove or disprove: Let $S = \{$ set of edges (u, v) such that there exists a cut $(S, V \setminus S)$ such that (u, v) is a light-edge crossing the cut $\}$. The set S is a minimum spanning tree of G. **(10 Points)**

Problem 5. For the approximate vertex cover algorithm, find a class of connected graphs and an ordering of edges so that when using the given order to choose edges, the algorithm outputs a vertex cover that has a size exactly equal to twice the size of an optimal cover. By a class of graphs, we mean a set of graphs $\mathcal{G} = \{G_1, G_2, \cdots, \}$ so that $\mathcal{G}$ has countably infinite many elements. **(10 Points)**