Advanced Analysis of Algorithms - Quiz II

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1 Instructions

1. Attempt as many problems as you can. You will be given partial credit.
2. The duration of this quiz is 1 hour, 20 minutes, i.e., 8 : 00-9 : 20 am.

2 Problems

1. Let $G =< V, E, c >$ denote an undirected graph with vertex set V, edge set E and a cost function c that assigns a positive integer $c(e)$ to each edge $e \in E$. If all the edge costs are unique, argue that G has a unique Minimum Spanning Tree. (7 points)
2. The Hamilton Cycle problem is defined as follows:
   HC: *Given an undirected graph $G =< V, E >$, with vertex set V and edge set E, is there a simple cycle in G, that visits all the vertices in V?*

   The Traveling Salesman problem is defined as follows:
   TSP: *Given a complete undirected graph $G =< V, E, c >$, with vertex set V, edge set E and a cost function c, that assigns a positive cost $c(e)$ to each edge $e \in E$, and a number K, does there exist a tour (simple cycle) of G that visits all the vertices in V, and whose cost at is at most K? The cost of a tour is defined as the sum of the costs of the edges in the tour.*

   Describe a polynomial time transformation of **HC** to **TSP**. (7 points)
3. Develop a counterexample to show that the greedy algorithm developed for the fractional Knapsack problem does not work for the 0/1 Knapsack problem. (6 points)