CSI - 3105 Design & Analysis of Algorithms
Fall 2019

Assignment #2
Deadline: Thursday, October 10, 2019
before 8:30 AM (to be delivered in my hands)

*Note: Make sure your handwriting is readable, otherwise your assignment
will not be marked.*

1. (10 marks) Let $G = (V, E)$ be a directed acyclic graph. A *Hamiltonian path* in G is a path which visits each vertex of V exactly once. Prove the following property:

$$G \text{ has a Hamiltonian path}$$
$$\text{if and only if}$$
$$G \text{ has a } unique \text{ topological ordering.}$$

   Note: Since the statement is an "if and only if", you must prove both directions.

2. (10 marks) Design a deterministic algorithm to solve the following problem.

   input: A directed acyclic graph $G = (V, E)$ stored using adjacency lists.

   output: A Hamiltonian path, if such a path exists. Otherwise, return **NONE**.

   Your algorithm must take $O(|V| + |E|)$ time. You must describe your algorithm in plain English (no pseudocode) and you must explain why the running time of your algorithm is $O(|V| + |E|)$. ***Maximum half a page.***