CSC373 Worksheet 7

August 14, 2020

1. **CLRS 34.1-2:** Give a formal definition for the problem of finding the longest simple cycle in an undirected graph. Give a related decision problem. Give the language corresponding to the decision problem.

2. **CLRS 34.1-3:** Give a formal encoding of directed graphs as binary strings using an adjacencymatrix representation. Do the same using an adjacency-list representation. Argue that the two representations are polynomially related.

3. **CLRS 34.1-4:** Is the dynamic-programming algorithm for the 0-1 knapsack problem that is asked for in Exercise 16.2-2 a polynomial-time algorithm? Explain your answer.

4. **CLRS 34.1-5:** Show that if an algorithm makes at most a constant number of calls to polynomialtime subroutines and performs an additional amount of work that also takes polynomial time, then it runs in polynomial time. Also show that a polynomial number of calls to polynomial-time subroutines may result in an exponential-time algorithm.

5. **CLRS 34.1-6:** Show that the class P, viewed as a set of languages, is closed under union, intersection, concatenation, complement, and Kleene star. That is, if $L_1, L_2 \in P$, then $L_1 \cup L_2 \in P$, $L_1 \cap L_2 \in P$, $L_1 L_2 \in P$, $L_1 \in P$ and $L_1^* \in P$.