CS 5800 – Assignment 6 – online submission – April 15, 2020 6 PM PST

1. Formal Encoding (25 pts.)

Given a directed graph, write its formal encoding as binary strings when graph is represented as (a) **Adjacency Matrix** and (b) **Adjacency List**. Prove that these two representations are also polynomially related.

2. Vertex Cover (25 pts.)

Vertex cover is a graph problem defined as follows. Given a graph G(V,E) and a positive integer K, you have to find if there is a subset of vertices V' of size at most K such that every edge in the graph G is connected to some vertex in V' (that is, all edges are covered).

Using NP reductions, prove that the Vertex Cover problem is NP Complete. For this problem, you can assume that Clique, 3-CNF-SAT, SAT and CIRCUIT-SAT are given as NP complete problems.

3. Cyclic Strings (25 pts.)

Write an algorithm to determine whether a text T is a cyclic rotation of another string T'. For eg: T = **arc** and T' = **car** are cyclic rotations of each other. Also provide the time and space complexity of your algorithm.

4. External Hashing (25 pts.)

Suppose that we are using **extendable hashing** on a file that contains records with the following search-key values: **3, 8, 11, 14, 15, 16, 17, 19, 20, 33, 43, 48**

Show the extendable hash structure for this file if the hash function is:

h(x) = x mod 7, and buckets can hold **3** records each.