# CS 6041 Theory of Computation

# Homework 6

**Format:** Your answer must be typed in BLUE. The figures can be in any color.

1. Let B be the set of all infinite sequences over {0,1}. Show that B is uncountable using a proof by diagonalization. (20 points)

Hint: “Theorem: R is uncountable” is the example that you can follow.

1. Show that EQ CFG is undecidable. (20 points)

Hint: You can directly use the result of Theorem 5.13. That is, instead of considering a reduction from ATM, you can directly consider a reduction from ALLCFG.

1. Find a match in the following instance of the Post Correspondence Problem. (20 points)

A close up of a clock

Description automatically generated

1. Answer each part TRUE or FALSE. (20 points)
2. 2n = O(n).
3. n2 = O(n).
4. 3n = 2O(n).
5. 22n = O(22n ).

Please also justify each of your true/false answers using the Definition 7.2.

In more details: what is f(n), what is g(n), whether c and n0 exist so that when n≥n0 that inequation is always true.

1. Let CONNECTED = {⟨G⟩| G is a connected undirected graph}. Analyze the algorithm given is in P. (Hint: Just prove the complexity of the algorithm is in O(nk)) (20 points)

For A, input G has n nodes

M = “On input ⟨G⟩, the encoding of a graph G:

1. Select the first node of G and mark it.

2. Repeat the following stage until no new nodes are marked:

3. For each node in G, mark it if it is attached by an edge to a

node that is already marked.

4. Scan all the nodes of G to determine whether they all are marked. If they are, accept; otherwise, reject.”