# CS 6041 Theory of Computation

# Homework 6

**Make sure you follow the instruction before submission:**

**1, Any late submission due to whatever reason will not be graded.**

**2, The answer should be written in BLUE and the figure can be any color. The wrong format submission might not be considered.**

**3, The submission file must be in PDF. Any other format (i.e., docx, pages) will not be graded. We don’t accept the hand-written submission.**

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.”

The course evaluation is open and please give us feedbacks on D2L before 7/26. Thank you for your time and effort. There will be **1% of bonus** for the overall score if you filled and please mark your name here:

[https://docs.google.com/spreadsheets/d/1hEap5nk2WPy48P4NTkU\_EJqutqZxaQJe\_LP3YHDpnwQ/edit?usp=sharing](https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fdocs.google.com%2Fspreadsheets%2Fd%2F1hEap5nk2WPy48P4NTkU_EJqutqZxaQJe_LP3YHDpnwQ%2Fedit%3Fusp%3Dsharing&data=05%7C01%7Cksuo%40kennesaw.edu%7C736682ba6869416c448108db82d9bd68%7C45f26ee5f134439ebc93e6c7e33d61c2%7C1%7C0%7C638247643988686005%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=vdE6pUvYQJDqU0POrQeYx5DFqny%2BnHn0r46XHz981MU%3D&reserved=0)