Week 10 CS-312 Homework

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December 9, 2020

1 Problem 1

1.1 Question

Show that it is undecidable if two TMs accept the same language.

1.2 Answer

2 Problem 2

2.1 Question

Show that $ALL_{DFA} \in \mathcal{P}$. That is, show that you can test in polynomial time whether a DFA accepts every string.

2.2 Answer

3 Problem 3

3.1 Question

Show that the set $\mathcal{P}$ is closed under the star operation. (Hint: Dynamic Programming)

3.2 Answer

4 Problem 4

4.1 Question A

Define SPATH as the set of $< G, a, b, k >$ such that G is a graph with a path from a to b of length at most k. Show that SPATH is in $\mathcal{P}$.

4.2 Question B

Define LPATH as the set of $< G, a, b, k >$ such that G is a graph with a path from a to b without repeated nodes of length at least k. Show that LPATH is $\mathcal{NP}$-Complete. (You may assume NP-completeness of HAMPATH).

4.3 Answer A

4.4 Answer B

5 Problem 5

5.1 Question

Show that if $\mathcal{P} = \mathcal{NP}$, then every language in $\mathcal{P}$ except $\emptyset$ and Σ^* is $\mathcal{NP}$-complete.

5.2 Answer

6 Problem 6

6.1 Question

Show that the CLIQUE problem is $\mathcal{NP}$-complete by reducing from VERTEX_COVER.

6.2 Answer

7 Problem 7

7.1 Question

Convince your instructor that you understood this course.

7.2 Answer