CS 1511 Exam II

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Instructions: This is a closed book, note and neighbor exam! You must **show all work** in the space provided on this test.

Name: _____

Question	Points	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

Question 1 (20 points)

a) Prove that the language ALL_{DFA} is decidable. Be sure to give complete details of the proof in addition to the details of your construction.

b) Is your decider an LBA? Explain.

Question 2 (20 points) Using a *diagonalization argument* prove that the set $\{f \mid f : \Sigma^* \longrightarrow \{0,1\}\}$ is uncountable, where $\{0,1\}$ is a subset of the natural numbers.

Question 3 (20 points)

a) Prove that A_{TM} is Turing Recognizable.

b) Prove that A_{TM} is not decidable.

Be sure to give complete details of the proofs in addition to the details of your constructions.

Question 4 (20 points) Fill in the table below with the correct entry of **Y** for "Yes" and **N** for "No".

Language	Turing-Recognizable	Co-Turing-Recognizable
E_{LBA}		
EQ_{TM}		
A_{LBA}		
EQ_{CFG}		
E_{DFA}		

Question 5 (20 points)

a) State the fixed-point version of the Recursion Theorem.

b) State the general version of the Recursion Theorem.

c) Prove the fixed-point version of the Recursion Theorem using the general version.