**COT 4210: Discrete Structures II**

**Exam #2**

**July 11, 2011**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**(Directions: Please justify your answer to each question. No answer, even if it is correct, will be given full credit without the proper justification.)**

1) (15 pts) Let X be the set of ordered pairs of binary strings with no leading zeros (except for the string 0). Is X countable? Provide proof or your answer.

2) (15 pts) Let the language BTM be defined as follws: { <M, w> | M is a TM and M rejects w }. Is BTM Turing decidable? If not, is it Turing Recognizable? Provide proof of your answer.

3) (15 pts) Let A = { <X, Y> | X and Y are DFAs such that L(X) $⊆$ L(Y)}. Prove that A is decidable.

4) (15 pts) Let DISJOINTTM = { <M1, M2> | M1 and M2 are Turing Machines with L(M1) $∩$ L(M2) = $∅$}. Show that DISJOINTTM is not decidable by showing that if you had a decider for DISJOINTTM, you could build a decider for ATM.

5) (15 pts) EQLBA = { <M1, M2> | M1 and M2 are LBAs with L(M1) = L(M2)}. Determine, with proof, whether or not EQLBA is decidable or undecidable.

6) (7 pts) What is the difference between an LBA and a regular Turing Machine?

7) (6pts) Circle the languages in the following list that are decidable:

ALBA ELBA ATM ETM ADFA EDFA

ACFG ECFG EQTM EQDFA EQCFG EQLBA

8) (7 pts) Find a solution to the PCP with the following set of tiles: {$\left[\frac{ac}{bb}\right]$,$ \left[\frac{ac}{ab}\right]$, $\left[\frac{a}{ac}\right]$, $\left[\frac{a}{abb}\right]$,$ \left[\frac{bb}{a}\right]$}.

9) (5 pts) Recently, Google+ was unveiled to a limited audience for use as a rival to Facebook. What company created Google+?

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**Scratch Page – Please clearly mark any work on this page you would like graded.**