Quiz 5

Name: **Time:** March 1 , 2016

Instructions: Please write down the correct answer for each question in the following box.

1	2	3	4	5	Total Score

1. Let us define an equivalence relation $\equiv$ on strings with respect to a language L as follows: $x \equiv_L y$ if and only if $\text{suffix}(L, x) = \text{suffix}(L, y)$. Let L be the set of all strings with odd number of $1s$. Which of the following is true?
   (A) $0 \equiv_L 1$
   (B) $00 \equiv_L 10$
   (C) $01 \equiv_L 00$
   (D) $01 \equiv_L 10$

2. Let $\equiv_L$ be as defined in Problem 1. We define an equivalence class $[x]_{\equiv_L}$ of a string x with respect to the relation $\equiv_L$ as follows: $[x]_{\equiv_L} = \{y \mid x \equiv_L y\}$. Let $L = \mathbf{L}((0 \cup 1)^*11(0 \cup 1)^*)$. Then, $[1]_{\equiv_L}$ is the set
   (A) $\mathbf{L}((0 \cup 1)^*1(0 \cup 1)^*)$
   (B) $\mathbf{L}((0 \cup 1)^*1)$
   (C) $\mathbf{L}((0 \cup \epsilon)(10 \cup 0)^*1)$
   (D) $\mathbf{L}((01 \cup 0)^*1)$

3. Let $\mathcal{C}_{\text{equiv}}(L) = \{[x]_{\equiv_L} | x \in \Sigma^*\}$, it is the set of all equivalence classes of $\equiv_L$. Let L_{odd} be the set of all strings with odd number of 1s, and L_{even} the set of all strings with even number of 1s. Then $\mathcal{C}_{\text{equiv}}(L_{odd})$ is:
   (A) $\{L_{odd}\}$
   (B) $\{L_{odd}, L_{even}\}$
   (C) $\{L_{even}\}$
   (D) $\{\}$

4. Recall $\mathcal{C}_{\text{suf}}(L)$ is the set of all suffix languages of L. Let $|S|$ denote the number of elements in S. Which of the following is true?
   (A) $|\mathcal{C}_{\text{equiv}}(L)| \geq |\mathcal{C}_{\text{suf}}(L)|$
   (B) $|\mathcal{C}_{\text{equiv}}(L)| = |\mathcal{C}_{\text{suf}}(L)|$
   (C) $|\mathcal{C}_{\text{equiv}}(L)| \leq |\mathcal{C}_{\text{suf}}(L)|$
   (D) $|\mathcal{C}_{\text{equiv}}(L)| \geq 2^{|\mathcal{C}_{\text{suf}}(L)|}$

5. Which of the following is false?
   (A) For every regular language L, $\mathcal{C}_{\text{equiv}}(L)$ is finite.
   (B) If $\mathcal{C}_{\text{equiv}}(L)$ is finite, then L is regular.
   (C) $\mathcal{C}_{\text{equiv}}(L)$ is finite for some non-regular languages.
   (D) $\mathcal{C}_{\text{equiv}}(L)$ is infinite for all non-regular languages.