Quiz 4
CS 373: Theory of Computation

Date: October 28, 2010. Lecture Section AL2. Time limit: 15 minutes.

Name	
netid	
Discussion	Tu 2-2:50 Tu 3-3:50 Tu 4-4:50 W 4-4:50 W 5-5:50

Pick the correct alternative from among the choices (A), (B), and (C) provided for each question below. Each question is worth **1 point**.

1. Suppose A and B are recursively enumerable languages such that $A \cup B = \Sigma^*$. Further, suppose $(A \cap \overline{B}) \cup (\overline{A} \cap B)$ is decidable. What can you say about A and B?

   (A) It is possible that neither A nor B is decidable.

   (B) At least one among A and B is decidable.

   (C) Both A and B are decidable.

2. Let L be recursively enumerable. Which of the following is true about L?

   (A) If $L' \subseteq L$ then L' is recursively enumerable.

   (B) If $L \subseteq L'$ then L' is recursively enumerable.

   (C) $L \leq_m A_{\text{TM}}$, where $A_{\text{TM}} = \{\langle M, w\rangle \mid w \in L(M)\}$

3. Let A and B be any languages such that $A \leq_m B$. Under what conditions is it the case that $\overline{A} \leq_m \overline{B}$?

   (A) Only when both A and B are decidable.

   (B) Only when both A and B are recursively enumerable.

   (C) Always.

4. Recall that $A_{\text{TM}} = \{\langle M, w\rangle \mid w \in L(M)\}$. Suppose $A_{\text{TM}} \leq_m L$. What can you say about L?

   (A) L is not decidable but is recursively enumerable.

   (B) L is not decidable but may or may not be recursively enumerable.

   (C) L is not recursively enumerable.

5. Which of the following **is** a property of recursively enumerable languages?

   - $\{M \mid M$ accepts 312929 strings$\}$.
   - $\{M \mid M$ has 312929 states$\}$.
   - $\{M \mid M$ has 312929 symbols in tape alphabet$\}$.

6. Let $L = \{M \mid M$ is a TM that accepts at most 312929 strings$\}$. Observe that $\overline{L}$ is recursively enumerable. What can you say about L?

   (A) L is decidable.

   (B) L is not decidable but is recursively enumerable.

   (C) L is not recursively enumerable.