

CS 360 Assignment 4

Due Date Tuesday, April 3rd, at the beginning of class.

All questions are worth the same amount. Please ensure that your name and student number appear, in ink, on each page of your assignment.

Work is to be done individually.

Assignment Questions

1. Let L_1, \dots, L_k be languages such that $L_i \subseteq \Sigma^*$ for each $i \in [1..k]$.

Suppose that for all $i, j \in [1..k]$: if $i \neq j$ then $L_i \cap L_j = \emptyset$; $\cup_{i \in [1..k]} L_i = \Sigma^*$; and for each $i \in [1..k]$, L_i is Turing recognizable. Show that each of the L_i are decidable.

2. If $A = \{ \langle M_1, M_2, k \rangle \mid M_1, M_2 \text{ are TMs and } L(M_1) \cap L(M_2) \text{ contains at least } k \text{ strings} \}$. Show A is Turing-recognizable.
3. Let $A = \{ \langle M \rangle \mid M \text{ is a TM that accepts } w^R \text{ if it accepts } w \}$. Show that A is not decidable.
4. Design a Turing machine to enumerate $\{0^n 1^n \mid n \geq 1\}$.