

HW 7 CMSC 452. Morally DUE March 25

(NOTE- because of spring break you have a LONG time to do it. So if you hand it in March 27 your Cat had better have needed a CAT-Scan.)

1. (0 points) What is your name? Write it clearly. Staple your HW. When is the midterm? Where is the midterm? When is the Final?
2. (30 points) Give a formal definition of a 2-tape Turing Machine. It will begin *a 2-tape TM is a tuple $(Q, \Sigma, \delta, q_{start}, q_{accept}, q_{reject})$ such that Q is a set of states, Σ is an alphabet, $q_{start}, q_{accept}, q_{reject} \in Q$ and δ is ...* YOU need to say what δ does.
3. (40 points) Let $G = (V, E)$ be a graph. A *vertex cover* of G is a set $U \subseteq V$ such that every edge $e \in E$ has at least one of its endpoints in U .
 - (a) Let C_n be the cycle on n vertices. What is the size of the smallest vertex cover of C_4 ? C_5 ? C_n ?
 - (b) Show that the following problem is in P : Given a graph G does it have a vertex cover of size ≤ 17 ?
4. (30 points) Let $x = x_1x_2 \cdots x_n$ be a string. A *subsequence* of x is a string of the form $x_{i_1}x_{i_2} \cdots x_{i_k}$ where $i_1 < i_2 < \cdots < i_k$. Let $L \subseteq \{0, 1\}^*$. Then

$$SUBSEQ(L) = \{w \mid (\exists x \in L)[w \text{ is a subsequence of } x]\}.$$

- (a) Show that if L is regular then $SUBSEQ(L)$ is regular.
- (b) (Think about, NOT to hand in.) True or false: *If $L \subseteq \{0\}^*$ and $L \in P$ then $SUBSEQ(L) \in P$.*
- (c) (Think about, NOT to hand in.) True or false: *If $L \subseteq \{0, 1\}^*$ and $L \in P$ then $SUBSEQ(L) \in P$.*