

Chapter 7.2 Practice

Show that the following problems are in NP by describing a non-deterministic TM and a verifier for each.

1. VERTEX COVER: A graph $G = (V, E)$ and a positive integer $k \leq |V|$ where there is a subset $V' \subseteq V$ such that $|V'| \leq k$ and, for each edge $uv \in E$, at least one of u and v belongs to V' .
2. HAMILTON CIRCUIT: A graph $G = (V, E)$. G contain a Hamiltonian circuit, that is, an ordering $\langle v_1, v_2, \dots, v_n \rangle$ of the vertices of G , where $n = |V|$, such that $v_nv_1 \in E$ and $v_i v_{i+1} \in E$ whenever $1 \leq i \leq n - 1$.
3. PARTITION: A multiset A of positive integer, and there is a subset $A' \subseteq A$ such that the sum of the elements of $A' =$ the sum of the elements of A that are not in A' .
4. 3-DIMENSIONAL MATCHING: A set $M \subseteq W \times X \times Y$, where W , X , and Y are disjoint sets with the same number q of elements, where M contain a subset $M' \subseteq M$ such that $|M'| = q$ and no two elements of M' agree in any coordinate.
5. FEEDBACK VERTEX SET: A directed graph $G = (V, A)$, integer $k \leq |V|$ where there is a subset $V' \subseteq V$ with $|V'| \leq k$ such that every directed cycle in G includes at least one vertex from V' .