UNLV CS456: Decide/Accept

1. A deterministic machine $M$ accepts a language $L$ if:
   (a) If $w \in L$, the computation of $M$ with input $w$ halts in an accepting state.
   (b) If $w \notin L$, the computation of $M$ with input $w$ does not halt in an accepting state.

2. A deterministic machine $M$ decides a language $L$ if:
   (a) If $w \in L$, the computation of $M$ with input $w$ halts in an accepting state.
   (b) If $w \notin L$, the computation of $M$ with input $w$ halts in a rejecting state.

3. A non-deterministic machine $M$ accepts a language $L$ if:
   (a) If $w \in L$, there is a computation of $M$ with input $w$ which halts in an accepting state.
      (This computation may require making “all the right guesses.”)
   (b) If $w \notin L$, there is no computation of $M$ with input $w$ which halts in an accepting state.

Let $T$ be an non-decreasing function on integers.

4. A deterministic machine $M$ accepts a language $L$ in time $T$ if:
   (a) If $w \in L$, the computation of $M$ with input $w$ halts in an accepting state within $T(n)$ steps, where $n = |w|$.
   (b) If $w \notin L$, the computation of $M$ with input $w$ does not halt in an accepting state.

5. A deterministic machine $M$ decides a language $L$ in time $T$ if:
   (a) If $w \in L$, the computation of $M$ with input $w$ halts in an accepting state within $T(n)$ steps, where $n = |w|$.
   (b) If $w \notin L$, the computation of $M$ with input $w$ halts in a rejecting state within $T(n)$ steps, where $n = |w|$.

6. If $T(n)$ is recursive (that means computable) and if, for any $n$, $T(n)$ can be computed within $O(T(n))$ steps, and if a language $L$ is accepted by some deterministic machine $M_1$ in time $T$, then $L$ is decided by some deterministic machine within time $O(T)$.

7. If $L$ is accepted by some deterministic machine $M$, then there is an increasing function $T$ such that $M$ accepts $L$ in time $T$. In this case, can we conclude that $L$ is decided by some deterministic machine?

8. A non-deterministic machine $M$ accepts a language $L$ in time $T$ if:
   (a) If $w \in L$, there is a computation of $M$ with input $w$ which halts in an accepting state within $T(n)$ steps, where $n = |w|$.
   (b) If $w \notin L$, there is no computation of $M$ with input $w$ which halts in an accepting state.