25 Lecture - CS402

Important Subjective

1. **Define what is meant by a nonregular language.**
   Answer: A nonregular language is a language that cannot be described by a regular expression or recognized by a finite automaton.

   What is the pumping lemma for regular languages?
   Answer: The pumping lemma for regular languages states that every regular language has a pumping length, such that any string longer than the pumping length can be divided into three parts: u, v, and w. For any integer i ? 0, the string uv^iw is also in the language.

   Explain the difference between a regular language and a context-free language.
   Answer: A regular language can be recognized by a finite automaton, while a context-free language can be recognized by a pushdown automaton.

   Give an example of a nonregular language.
   Answer: An example of a nonregular language is the language of all palindromes over the alphabet {a, b}, where the number of a's and b's is equal.

   What is the Myhill-Nerode theorem?
   Answer: The Myhill-Nerode theorem is a theorem in formal language theory that states that a language is regular if and only if it has a finite number of equivalence classes under the right-invariant and left-invariant relations defined by the language.

   What is the difference between a deterministic finite automaton (DFA) and a nondeterministic finite automaton (NFA)?
   Answer: A deterministic finite automaton has exactly one transition for each input symbol and current state, while a nondeterministic finite automaton may have multiple transitions for the same input symbol and current state.

   Can a nonregular language be context-free?
   Answer: Yes, a nonregular language can be context-free.

   What is the closure property of regular languages?
   Answer: The closure property of regular languages states that the union, concatenation, and Kleene star of regular languages are also regular.

   Give an example of a language that is not regular.
   Answer: An example of a language that is not regular is the language of all strings of the form 0^n1^n2^n, where n is a nonnegative integer.

   How can the pumping lemma be used to prove that a language is not regular?
   Answer: The pumping lemma can be used to prove that a language is not regular by assuming that the language is regular, choosing a string that is longer than the pumping length, and showing that the string cannot be pumped. This contradicts the assumption that the language is

regular, so the language must be nonregular.