

23 Lecture - CS402

Important Subjective

1. Define regular languages and provide examples.

Answer: Regular languages are a class of formal languages that can be recognized by a deterministic or non-deterministic finite automaton. Examples of regular languages include binary strings with an even number of 0's, strings of a's and b's where every a is followed by a b, and strings of a's and b's that contain at least one a and at least one b.

Explain the Pumping Lemma for regular languages.

Answer: The Pumping Lemma for regular languages states that for any regular language L , there exists a constant n such that any string in L of length greater than or equal to n can be divided into three parts: u , v , and w , such that uvw is in L , $|v| > 0$, and for all $i \geq 0$, uv^iw is also in L .

What is the difference between a regular language and a context-free language?

Answer: The main difference between a regular language and a context-free language is the type of grammar used to generate the language. Regular languages are generated by regular grammars, while context-free languages are generated by context-free grammars.

Provide an example of a regular expression for a language that accepts all strings of 0's and 1's that contain the substring "101".

Answer: The regular expression for this language is $(0+1)^*101(0+1)^*$.

Can a regular language have an infinite number of strings? Explain your answer.

Answer: Yes, a regular language can have an infinite number of strings. For example, the language of all strings of 0's and 1's is a regular language and has an infinite number of strings.

Explain the concept of closure properties in the context of regular languages.

Answer: Closure properties refer to the ability of regular languages to be combined and transformed in various ways to create new regular languages. Closure properties include union, concatenation, and Kleene star.

What is the difference between a deterministic finite automaton (DFA) and a non-deterministic finite automaton (NFA)?

Answer: The main difference between a DFA and an NFA is in their transition functions. In a DFA, each transition is uniquely determined by the current state and the input symbol, while in an NFA, there may be multiple possible transitions for a given input symbol and state.

Define a regular grammar and provide an example.

Answer: A regular grammar is a type of grammar that generates a regular language. It consists of a set of productions, where each production is of the form $A \rightarrow aB$ or $A \rightarrow a$, where A and B are non-terminals and a is a terminal symbol. An example of a regular grammar is $S \rightarrow 0S \mid 1S \mid ?$, which generates the language of all strings of 0's and 1's.

What is the difference between a regular expression and a regular grammar?

Answer: The main difference between a regular expression and a regular grammar is the way

they describe regular languages. A regular expression is a pattern that describes a set of strings, while a regular grammar is a set of production rules that generate the same set of strings.

Can every regular language be recognized by a deterministic finite automaton? Explain your answer.

Answer: Yes, every regular language can be recognized by a deterministic finite automaton, as a DFA is equivalent in power to a regular expression and can recognize any regular language.