

# 41 Lecture - CS402

## Important Subjective

### 1. What is a non-context-free language?

Answer: A non-context-free language is a language that cannot be generated by a context-free grammar. These languages require more powerful formalisms like context-sensitive grammars or Turing machines.

### What is the difference between context-free and non-context-free languages?

Answer: Context-free languages can be generated by context-free grammars, while non-context-free languages cannot. Non-context-free languages require more powerful formalisms like context-sensitive grammars or Turing machines.

### Give an example of a non-context-free language.

Answer: The language of palindromes is an example of a non-context-free language. It cannot be generated by a context-free grammar.

### Can a non-context-free language be recognized by a finite automaton?

Answer: No, a non-context-free language cannot be recognized by a finite automaton. It requires more powerful formalisms like a pushdown automaton or a Turing machine.

### What is the significance of non-context-free languages?

Answer: Non-context-free languages have important applications in programming language design, natural language processing, and theoretical computer science. Understanding their properties and limitations is essential for building complex systems that can handle natural language and other forms of structured data.

### What is the Chomsky hierarchy?

Answer: The Chomsky hierarchy is a way of classifying formal languages based on the types of grammars that can generate them. The hierarchy consists of four levels: regular, context-free, context-sensitive, and unrestricted.

### Can a regular grammar generate a non-context-free language?

Answer: No, a regular grammar cannot generate a non-context-free language. Non-context-free languages require more powerful formalisms like context-sensitive grammars or Turing machines.

### What is the relationship between context-sensitive grammars and non-context-free languages?

Answer: Context-sensitive grammars can generate non-context-free languages. Non-context-free languages require more powerful formalisms like context-sensitive grammars or Turing machines.

### What is the Pumping Lemma for context-free languages?

Answer: The Pumping Lemma for context-free languages is a tool used to prove that a language is not context-free. It states that for any context-free language  $L$ , there exists a

constant  $n$  such that any string in  $L$  with length greater than  $n$  can be divided into five pieces,  $uvxyz$ , such that  $|vxy| \leq n$ ,  $|vy| \geq 1$ , and for all  $i \geq 0$ , the string  $uv^i xy^i z$  is also in  $L$ .

**Can a context-sensitive grammar generate a regular language?**

Answer: Yes, a context-sensitive grammar can generate a regular language. All regular languages are also context-sensitive.