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**18/SCI01/106**

**CSC 312**

1. A grammar is a set of rules that define what strings constitute a language. It describes how to form strings from a language's alphabet that are valid according to the language's syntax. A formal grammar is defined as a set of production rules for strings in a formal language. A grammar has multiple purposes in relation to a language. It describes via rules what sentences the (often infinite) language contains (and can be used to generate a parser). It can also be used to generate (syntactically) valid sentences of the language. Most importantly, it relates the sentences of the language to their structure and categorizes parts of the sentence, which is the feature used by parsers.

I. **Derivation:** A derivation is basically a sequence of production rules, in order to get the input string. A derivation is a sequence of replacements of nonterminals using derivation rules given as a part of grammar. During parsing, we take two decisions for some sentential form of input:

-Deciding the non-terminal which is to be replaced.

-Deciding the production rule, by which, the non-terminal will be replaced.

To decide which non-terminal to be replaced with production rule, we can have two options.

* **Left-most Derivation:** If the sentential form of an input is scanned and replaced from left to right, it is called left-most derivation. The sentential form derived by the left-most derivation is called the left-sentential form.
* **Right-most Derivation:** If we scan and replace the input with production rules, from right to left, it is known as right-most derivation. The sentential form derived from the right-most derivation is called the right-sentential form.

Ii. **Production:** The productions of a grammar specify the manner in which the terminals and non-terminals can be combined to form strings. Each production consists of a non-terminal called the left side of the production, an arrow, and a sequence of tokens and/or on- terminals, called the right side of the production. One of the non-terminals is designated as the start symbol (S); from where the production begins.

Iii. **Sentence:** A sentence is a group of character over some alphabet.A sentence is a sentential form that has only terminal symbols.

Iv. **Null symbol:** Empty string denotes zero occurrence of input symbol. It is represented by Ɛ(epsylon). It is a set that contains an empty string, it is a special string that contains zero symbols.