# **Ambiguity Grammar**

A grammar is said to be **ambiguous** if there exists more than one left most derivation or

more than one right most derivation or more than one parse tree for a given input string.

If the grammar is not ambiguous then we call it unambiguous grammar.

This means, if, for all **x** belonged to L(G), any derivation of **x** yields the **same derivation tree**, the CFG, G, is said "**unambiguous**". If on the other hand, two or more distinct derivation trees exist for some x belong to L(G), G is said to be "**ambiguous**".

**For example,** the following grammar is **ambiguous**:

 $S \rightarrow SbS | SdS | a$ 

To derive abada ,we have two derivation trees

- 1)  $S \rightarrow SbS \rightarrow abS \rightarrow abSdS \rightarrow abada$
- 2)  $S \rightarrow SdS \rightarrow SbSdS \rightarrow abSdS \rightarrow abada$

# Example:

The following grammar is **unambiguous**:

- $S \rightarrow AB$
- $A \rightarrow aA | a$
- B → bB |b

There are some alternative derivations of  $a^3b^2$ 

#### **Equivalent Grammar**

Grammars are said to be **equivalent** if they produce the **same language**. Sometimes, may be that **two different grammars** G1 and G2 generate the **same language** 

$$\mathbf{L}(\mathbf{G}) \equiv \mathbf{L}(\mathbf{G2}).$$

In that case the grammars are said to be equivalent.

### Example 1:

Let G1 with production:

 $\begin{array}{cccc} S \longrightarrow & A & | & B \\ A \longrightarrow & aA & | & a \\ B \longrightarrow & bB & | & b \end{array}$ 

The grammar equivalent to G1 is G2 with production:

 $S \longrightarrow aA \mid bB \mid a \mid b$   $A \longrightarrow aA \mid a$  $B \longrightarrow bB \mid b$ 

Because the G1 and G2 generate the same language.

## H.w:

Find the equivalent to G1 with production:

 $\begin{array}{ccc} S \longrightarrow & 0A \\ A \longrightarrow & dA \mid dB \\ B \longrightarrow & bB \mid b \end{array}$