

Assignment 02

Derivation, Parse Tree, Ambiguity Solution

You may find a few more solutions from the practice sheet in the Ambiguity Practice Solution-1 pdf.

Problem 5 (CO3): Derivations, Parse Trees and Ambiguity (10 points)

Take a look at the grammar below and solve the following problems.

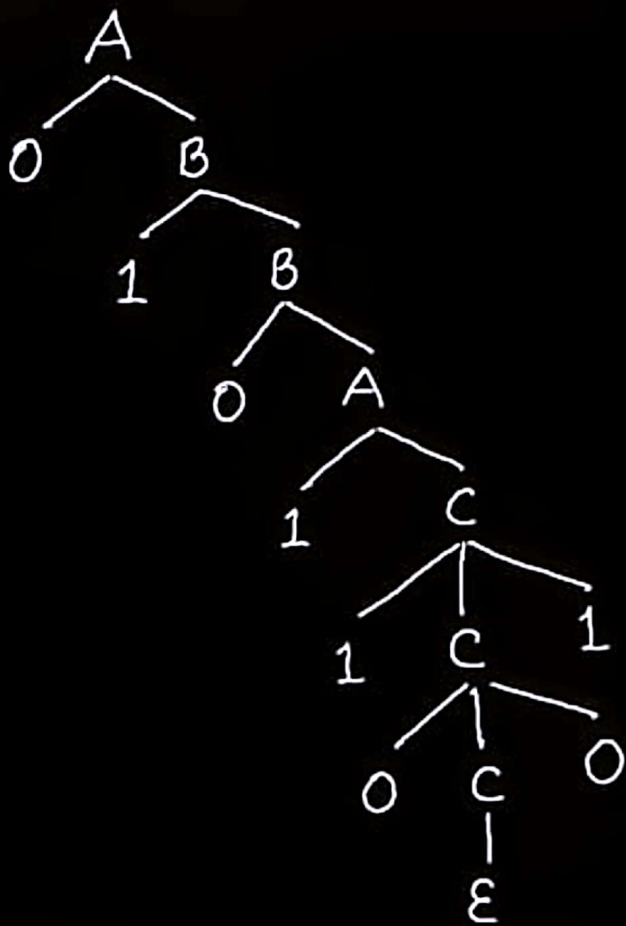
$$A \rightarrow 1A \mid 1C \mid 0B \mid 00A$$

$$B \rightarrow 0A \mid 1B \mid 00B$$

$$C \rightarrow 0C0 \mid 0C1 \mid 1C0 \mid 1C1 \mid \epsilon$$

- (a) Give a leftmost derivation for the string 01011001. (3 points)
- (b) Sketch the parse tree corresponding to the derivation you gave in (a). (2 points)
- (c) Demonstrate that the given grammar is ambiguous by showing two more parse trees (apart from the one you already found in (b)) for the same string. (3 points)
- (d) Find a string w of length six such that w has exactly one parse tree in the grammar above. (1 point)
- (e) Design an unambiguous Context Free Grammar for the language represented by the given ambiguous grammar. (1 point)

01011001



$A \rightarrow 0B$

$\rightarrow 01B$

$\rightarrow 010A$

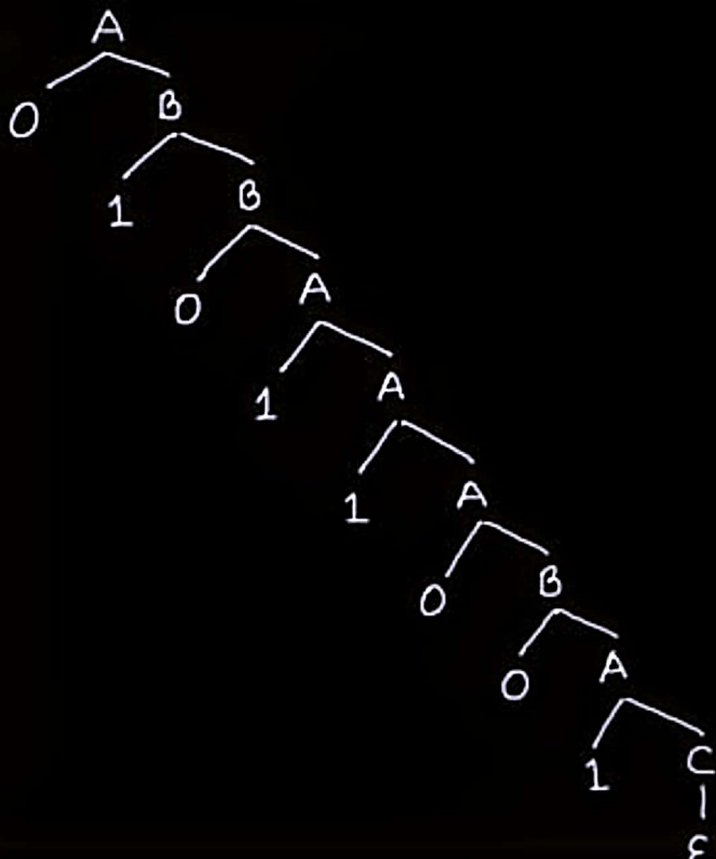
$\rightarrow 0101C$

$\rightarrow 01011C1$

$\rightarrow 010110C01$

$\rightarrow 01011001$

01011001



$A \rightarrow 0B$

$\rightarrow 01B$

$\rightarrow 010A$

$\rightarrow 0101A$

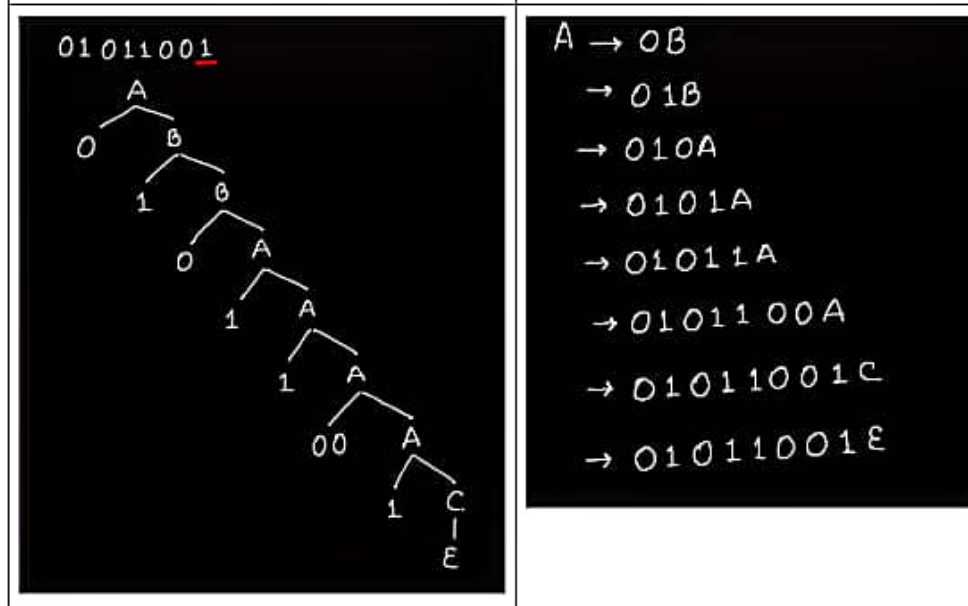
$\rightarrow 01011A$

$\rightarrow 010110B$

$\rightarrow 0101100A$

$\rightarrow 01011001C$

$\rightarrow 01011001\epsilon$



Question (d):

The language is to parse the strings which contain at least one 1, such that there is an even number of 0s before the 1, and the remaining length is even after the 1.

(d) The format of the string will be

$\overline{\hspace{2cm}} 1 \overline{\hspace{2cm}}$
 $\downarrow \hspace{1.5cm} \downarrow$
 even 0 even length
 and no consecutive 0s
 (00,000 and so on)

Exactly one such 1, which
has these two properties

010100, 110000, 010101, 010110, 110001, 110010, 110100, 111000, 011011,
011101, 101011, 101101, 110011, 110110, 111001, 111010, 110111, 111011