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.

$$A \to 1A \mid 1C \mid 0B \mid 00A$$
$$B \to 0A \mid 1B \mid 00B$$
$$C \to 0C0 \mid 0C1 \mid 1C0 \mid 1C1 \mid \epsilon$$

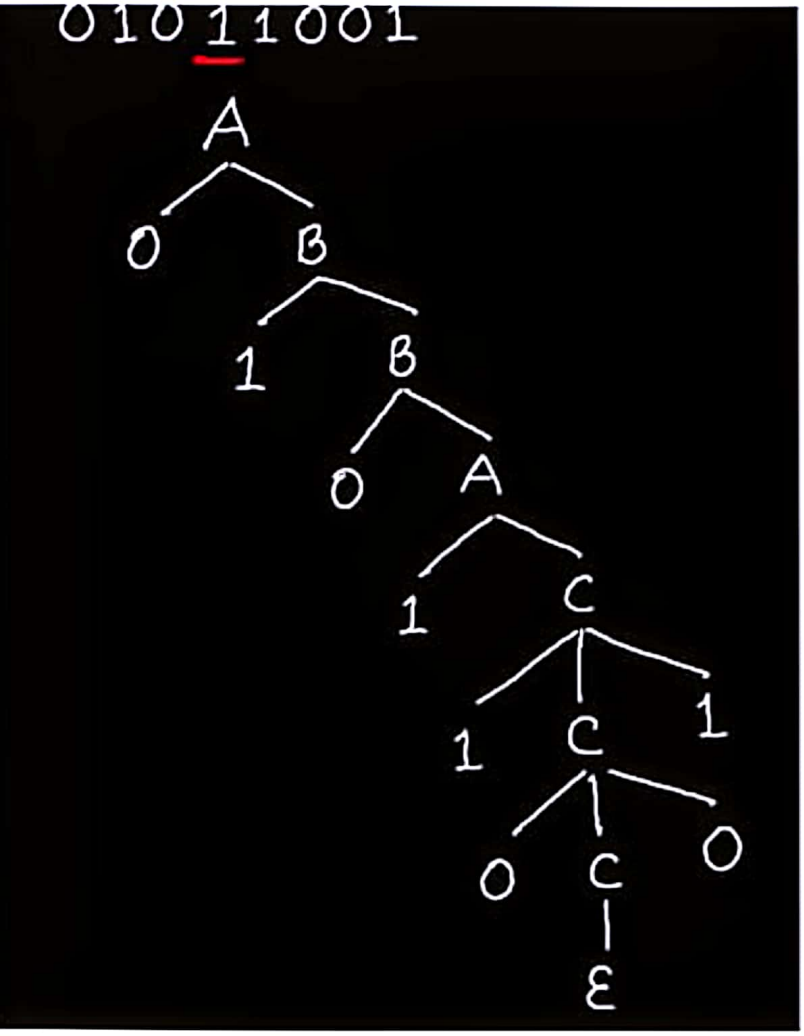
(a) **Give** a leftmost derivation for the string 01011001. (3 points)

(b) **Sketch** the parse tree corresponding to the derivation you gave in (a). (2 points)

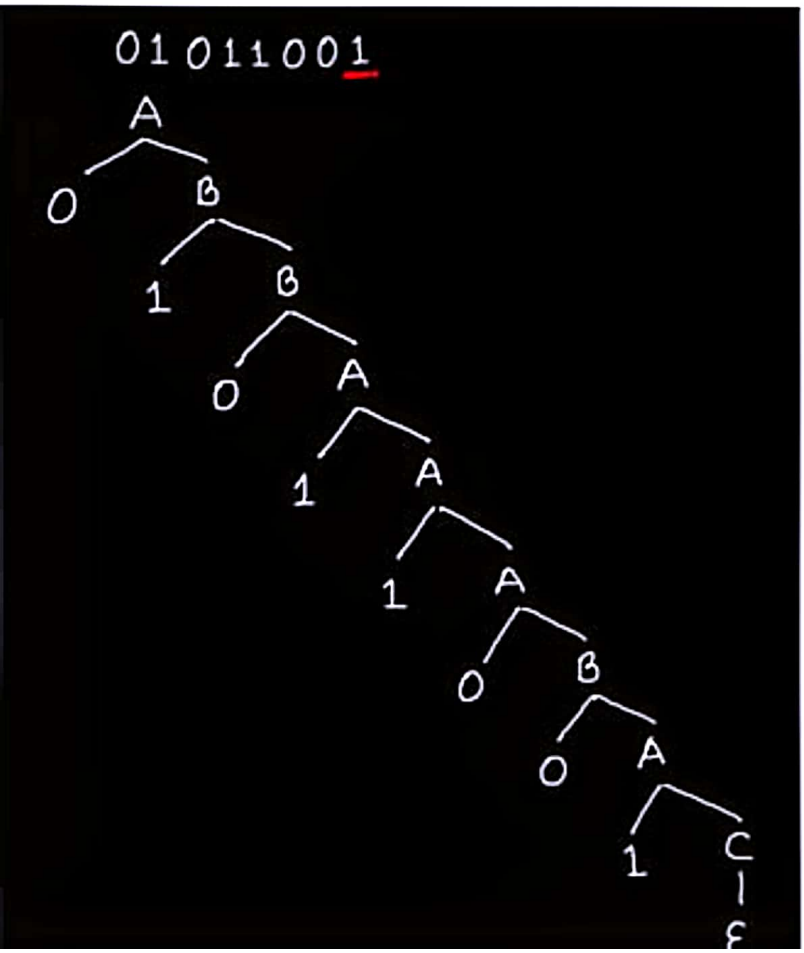
(c) **Demonstrate** that the given grammar is ambiguous by showing two more parse trees (apart from the one you already found in (b)) for the same string. (3 points)

(d) **Find** a string w of length six such that w has exactly one parse tree in the grammar above. (1 point)

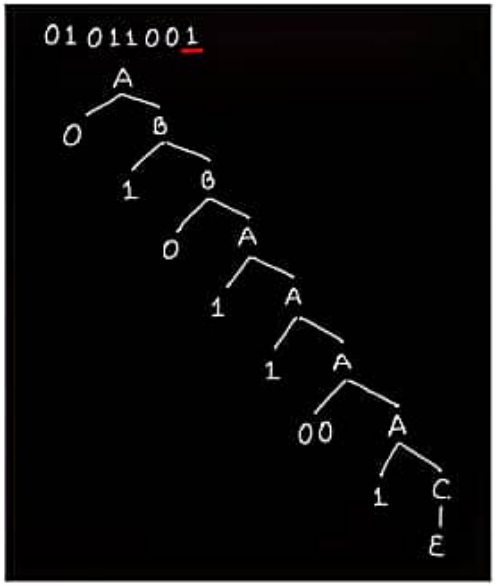
(e) **Desgin** an unambiguous Context Free Grammar for the language represented by the given ambiguous grammar. (1 point)

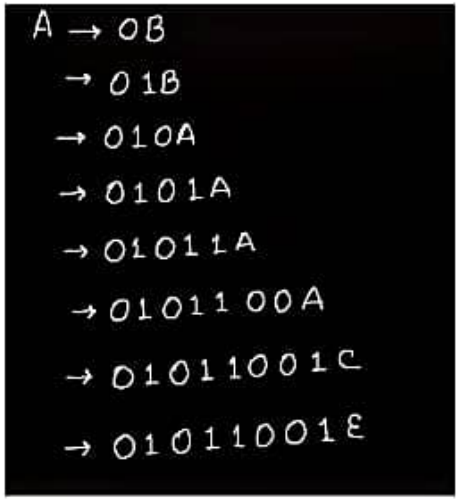


$A \rightarrow 0B$
$\rightarrow 01B$
$\rightarrow 010A$
$\rightarrow 0101C$
$\rightarrow 01011C1$
$\rightarrow 0101100C01$
$\rightarrow 01011001$



$A \rightarrow 0B$
$\rightarrow 01B$
$\rightarrow 010A$
$\rightarrow 0101A$
$\rightarrow 01011A$
$\rightarrow 0101100B$
$\rightarrow 01011001A$
$\rightarrow 01011001C$
$\rightarrow 01011001\varepsilon$





Question (d):

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