Problem

Let
$C = \{x\#y \mid x, y \in \{0,1\}^* \text{ and } x \neq y\}$. Show that C is a context-free language.

Step-by-step solution

Step 1 of 2

The grammar *C* is defined as follows:

$C = \{ x\#y \mid x, y \in \{0, 1\}^* \text{ and } x \neq y \}.$

Comment

Step 2 of 2

• Given that a string $x\#y$ is in language *C* if and only if $x \neq y$ or strings *x* and *y* vary at some specific position; Such as for *i*-index value of *x* is different from the character value of *y*.

• It is very easy to form a Context free grammar which produce all the strings of the form $x\#y$ with $x \neq y$.

The CFG grammar is as follows:

$S \rightarrow A\#B \mid B\#A$
$A \rightarrow TAT \mid 0$
$B \rightarrow TBT \mid 1$
$T \rightarrow 0 \mid 1$

As the grammar for *C* is defined in terms of CFG. The language produces a string that contains $x\#y$, and *x* and *y* are different character for same index position.

Hence, it is proved that *C* is Context Free Language.

Comments (4)