13.1 Languages and Grammar

13.1 pg. 856 # 5

Let $G = (V, T, S, P)$ be the phrase-structure grammar with $V = \{0, 1, A, B, S\}$, $T = \{0, 1\}$, and set of productions P consisting of $S \to 0A, S \to 1A, A \to 0B, B \to 1A, B \to 1$.

a) Show that 10101 belongs to the language generated by G.

b) Show that 10110 does not belong to the language generated by G.

c) What is the language generated by G?

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Find a phrase-structure grammar for each of these languages.

a) the set consisting of the bit strings 0, 1, and 11

b) the set of bit strings containing only 1s

c) the set of bit strings that start with 0 and end with 1

d) the set of bit strings that consist of a 0 followed by an even number of 1s.

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Construct phrase-structure grammars to generate each of these sets.

a) $\{0^n | n \geq 0\}$

b) $\{1^n 0 | n \geq 0\}$

c) $\{(000)^n | n \geq 0\}$

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Construct a derivation tree for -109 using the given grammar.
$\langle signed\ integer \rangle ::= \langle sign \rangle \langle integer \rangle$
$\langle sign \rangle ::= +|-$
$\langle integer \rangle ::= \langle digit \rangle | \langle digit \rangle \langle integer \rangle$
$\langle digit \rangle ::= 0|1|2|3|4|5|6|7|8|9$

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Give production rules in Backus-Naur form for an identifier if it can consist of

a) one or more lowercase letters.

b) at least three but no more than six lowercase letters.

c) one to six uppercase or lowercase letters beginning with an uppercase letter.

d) a lowercase letter, followed by a digit or an underscore, followed by three or four alphanumeric characters (lower or uppercase letters and digits).