

CSE105 Closed Book Quiz, Thursday, Nov. 11, 1999

1. Construct a CFG for the language

$$\{0^n 1^m \mid 1 \leq n \leq m\}$$

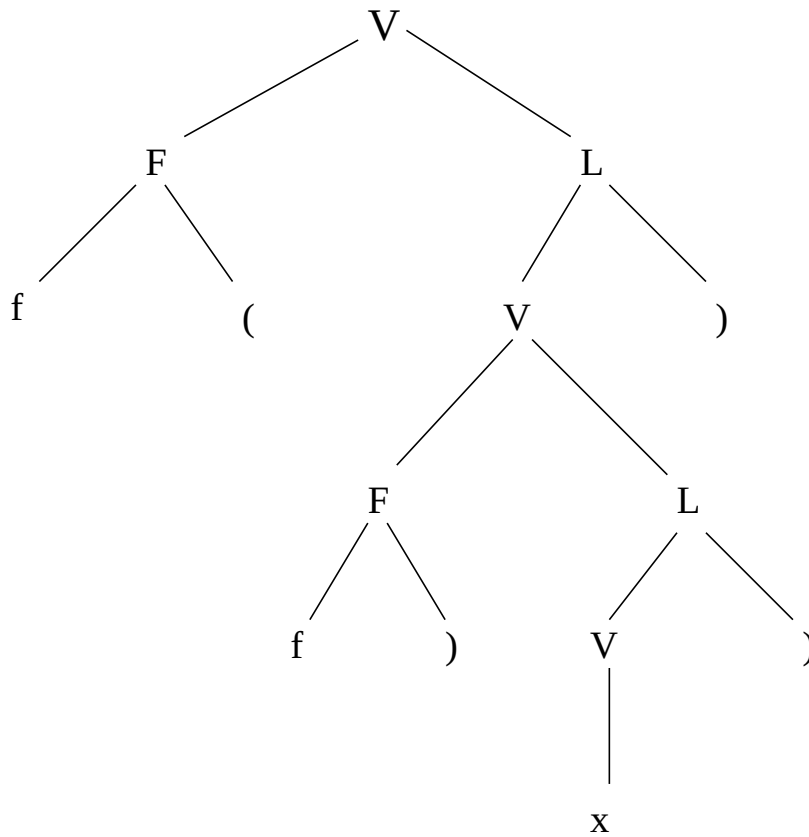
$$S \rightarrow 0S1 \mid S1 \mid 01$$

2. Draw a parse tree for the string **f(f(x))** using the CFG below. (Here, the nonterminals of the grammar are $\{ () x f \}$, and the start variable is V)

$$V \rightarrow x \mid f \mid FL$$

$$F \rightarrow f($$

$$L \rightarrow V)$$

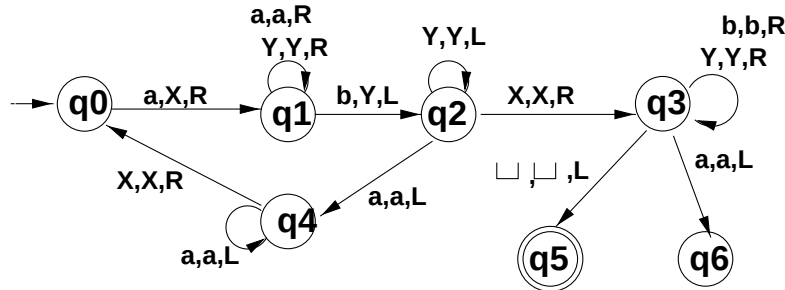


3. Given the Turing machine below for $\{a^n b^m \mid 1 \leq n \leq m\}$, show the configurations of the Turing machine on input $aabbb$, beginning with the start configuration.

$Q = \{q_0, q_1, q_2, q_3, q_4, q_5, q_6\}$

$\Sigma = \{a,b\}$ $\Gamma = \{a,b, X, Y, \sqcup\}$

q_0 start q_5 accept q_6 reject



$q_0 aabbb \sqcup$
 $X q_1 aabbb \sqcup$
 $X a q_1 bbb \sqcup$
 $X q_2 a Y bb \sqcup$
 $q_4 X a Y bb \sqcup$
 $X q_0 a Y bb \sqcup$
 $XX q_1 Y bb \sqcup$
 $XX Y q_1 bb \sqcup$
 $XX q_2 Y Y b \sqcup$
 $X q_2 X Y Y b \sqcup$
 $XX q_3 Y Y b \sqcup$
 $XX Y q_3 Y b \sqcup$
 $XX Y Y q_3 b \sqcup$
 $XX Y Y b q_3 \sqcup$
 $XX Y Y q_5 b \sqcup$

ACCEPT

4. Fill in the blanks: A derivation in a CFG is leftmost if
 at every step, the leftmost remaining variable is the one replaced.