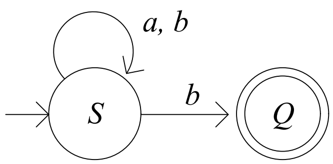
Quiz 6 Solutions

(1) Suppose you use the procedure described in class to convert the following NFA M into a right-liner grammar $G = (V, \Sigma, R, S)$ for the same language. How many rules will G have? (I'm only asking for the number of rules; no need to list them. Remember to include in your count both rules of the form $A \to aB$ and any of the form $A \to \varepsilon$, where A and B are variables and a is a terminal.)



4 rules

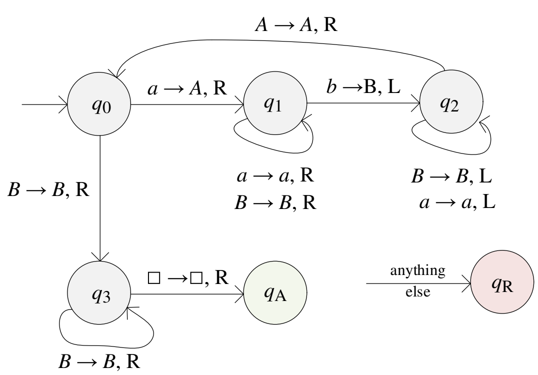
(2) Write the rules for a CFG $G = (V, \Sigma, R, S)$ for the language $L = \{a^n \# a^n : n \geq 0\}$. Two rules suffice, so please don't use more. The alphabet is $\Sigma = \{a, \#\}$.

$S \longrightarrow a\ S\ a \mid \#$

(3) Define what it means for a CFG $G = (V, \Sigma, R, S)$ to be *ambiguous*. Make your English grammatical and precise, and don't use any form of the word "ambiguous" in your definition.

A grammar G is ambiguous if there is some $w \in L(G)$ where w has two different parse trees (equivalently, two or more leftmost derivations).

(4) Below is the Turing Machine M described in class that accepts $L = \{a^n b^n : n \geq 1\}$.



Suppose you run M on $a^{10}\ b^{10}$. When it accepts, the tape will have on it how many a's, b's, A's, and B's?

a: 0 b: 0

A: 10 B: 10

(5) Darken the box if the statement is **true**.

True Every regular language is context free.

True An unrestricted grammar could have a rule $Ad \to cB$ (with A, B variables, c, d terminals)