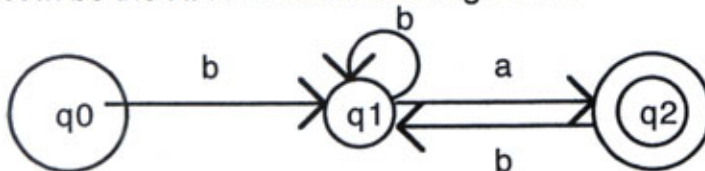


1. Let  $G$  be the grammar  $S \rightarrow SAB \mid \lambda$ ,  $A \rightarrow aAb \mid ab$ ,  $B \rightarrow bBa \mid ba$ .
  - a) Give a leftmost derivation of  $abbbaaaabbba$ .
  - b) Give a rightmost derivation of the same string.
2. Let  $G$  be the grammar  $S \rightarrow aSb \mid A$ ,  $A \rightarrow ccAdd \mid ccdd$ .
  - a) Give a derivation of  $aaccddbb$ .
  - b) Show the derivation tree for the derivation in a).
  - c) Use set notation to describe  $L(G)$ .
3. Construct a grammar over  $\{a,b,c\}$  whose language is  $\{a^n b^{2n} c^{2m} \mid n,m > 0\}$ .
4. Let  $G$  be the grammar  $S \rightarrow SAB \mid \lambda$ ,  $A \rightarrow aaA \mid aa$ ,  $B \rightarrow bB \mid \lambda$ . Give a regular expression for  $L(G)$ .
5. Let  $G$  be the grammar  $S \rightarrow aaSbb \mid A$ ,  $A \rightarrow cA \mid c$ . Use set notation to show  $L(G)$ .
6. Let  $M$  be the NFA whose state diagram is:



- a) Construct a regular grammar from  $M$  that generates  $L(M)$ .
  - b) Give a regular expression for  $L(M)$ .
7. Let  $G$  be the regular grammar  $S \rightarrow aS \mid aA \mid a$ ,  $A \rightarrow aA \mid bB$ ,  $B \rightarrow bB \mid b$ 
    - a) Show an NFA that accepts  $L(G)$ .
    - b) Give a regular expression for  $L(G)$ .
  8. Give the state diagram for a complete DFA that accepts  $a(ba)^*$ .
10. Give a regular expression for the set of strings over  $\{a,b\}$  that do not contain the substring  $bb$ .