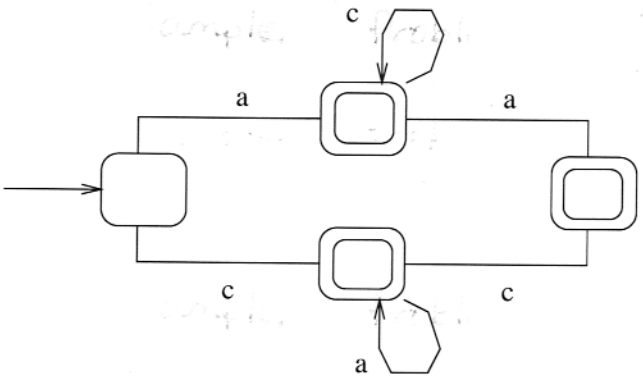
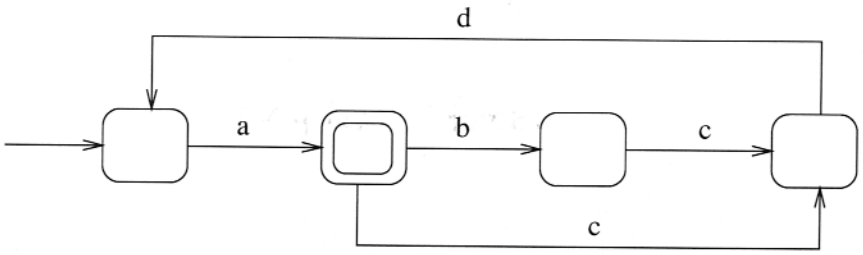
Sample Problems

1. Exercise 2.1 from the text on regular expression construction.
2. Construct a deterministic finite state machine that can detect strings generated by the following regular expression:
   (a) $(a \mid (b\ c)^* d)^+$
   (b) $(a\ a \mid b)^*(a \mid b\ b)^*$
   (c) $((011)^*(2 \mid 3)^+) \mid 0011$
   (d) $((\epsilon \mid a)b^*)^*$
   (e) Construct DFAs for regular expressions given in Exercise 2.2 of the text.
3. Construct a regular expression that generates the strings accepted by the following deterministic finite state machine.

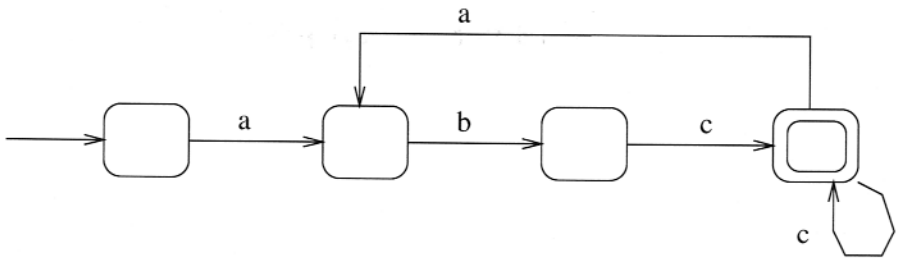
(a)



(b)



(c)



4. Exercises 3.1, 3.2, 3.3 and 3.5 from the text on CFGs, derivations and parse trees.

5. Compute First and Follow sets for all the non-terminals in the following grammars.

   (a) Expr → - Expr
   Expr → (Expr)
   Expr → Var ExprTail
   ExprTail → - Expr
   ExprTail → ϵ
   Var → id VarTail
   VarTail → (Expr)
   VarTail → ϵ

   (b) $S \rightarrow Ab$
   $A \rightarrow a \mid B \mid \epsilon$
   $B \rightarrow b \mid \epsilon$

   (c) $S \rightarrow A\ B\ B\ A$
   $A \rightarrow a \mid \epsilon$
   $B \rightarrow b \mid \epsilon$

6. For the following grammar show the state diagram built in constructing the SLR(1) parser. Does the state diagram contain any conflicts?

   (a) S → id := E;
   E → E+P
   E → P
   P → id
   P → (E)
   P → id := E

   (b) $S \rightarrow id := A;$
   $A \rightarrow id := A$
   $A \rightarrow E$
   $E \rightarrow E + P$
   $E \rightarrow P$
   $P \rightarrow id$
   $P \rightarrow (id; id)$
   $P \rightarrow (A)$

7. Exercises 5.1 and 5.3 from the text on SLR(1) parsing. Also 5.7, 5.11 and 5.12.

8. Exercises 4.1 through 4.10 on Top-down parsing.