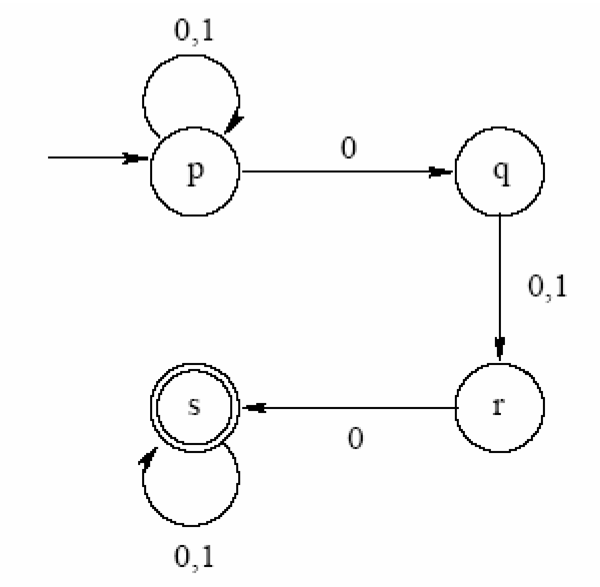
Name______________

CS3133
Homework #3

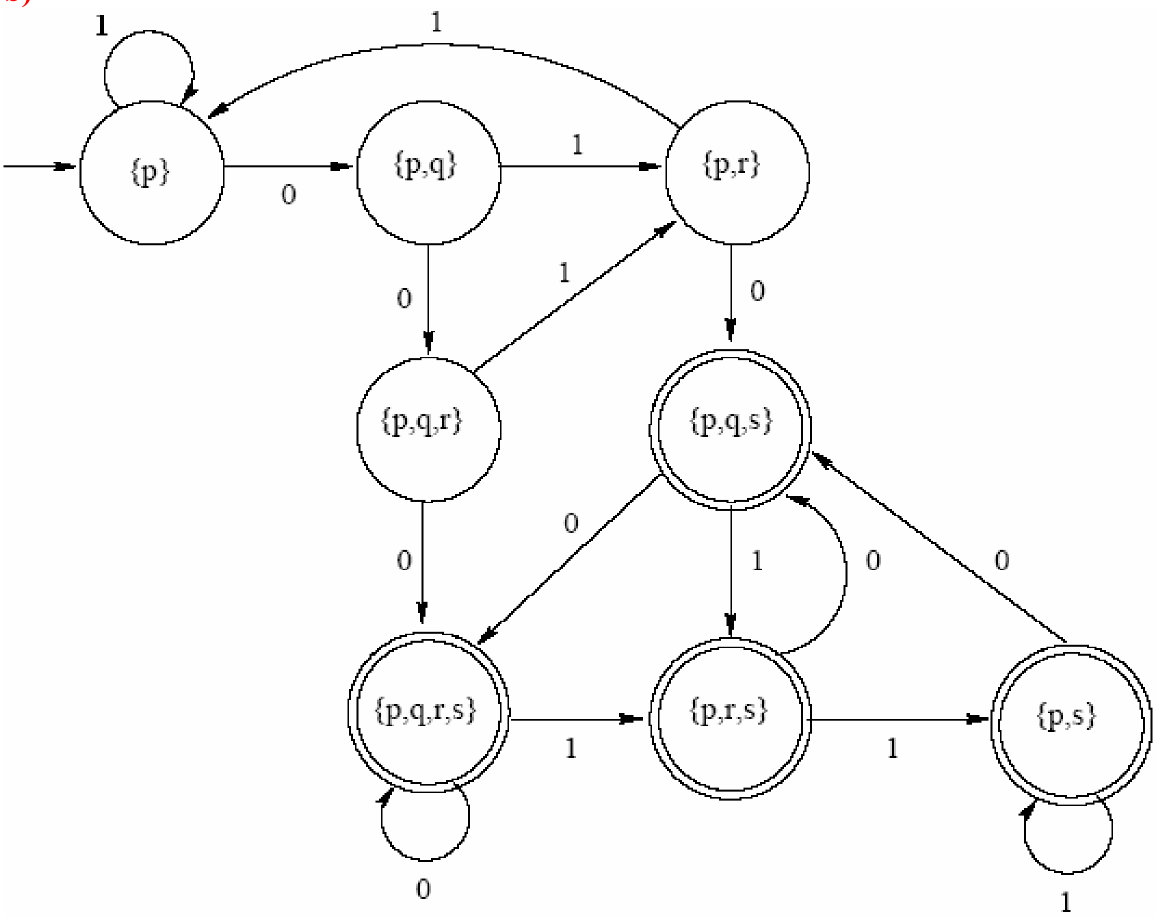
People talked to and URL's consulted:

#1. a) Use the subset construction to convert the following NFA to a DFA:

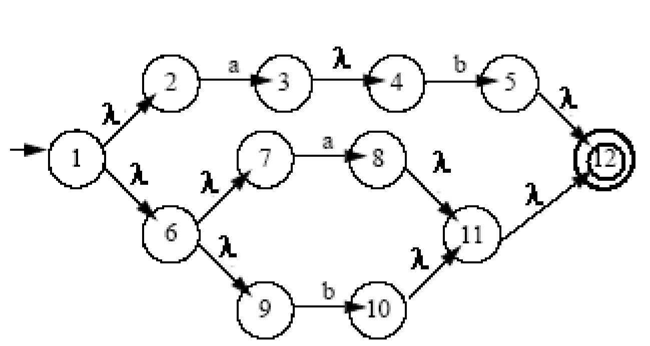


Solution

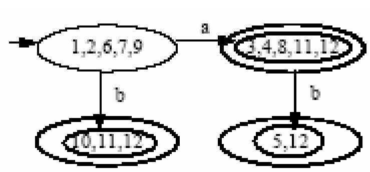
b)



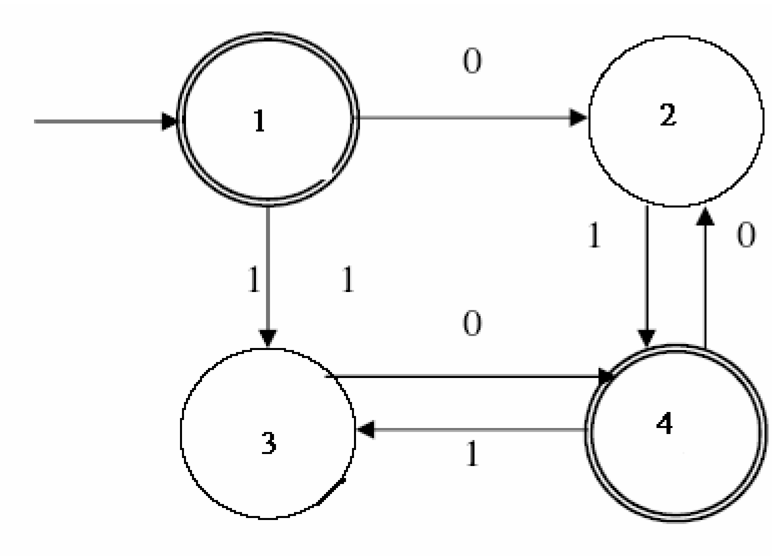
b) Use the subset construction to convert the following nfa to a dfa:



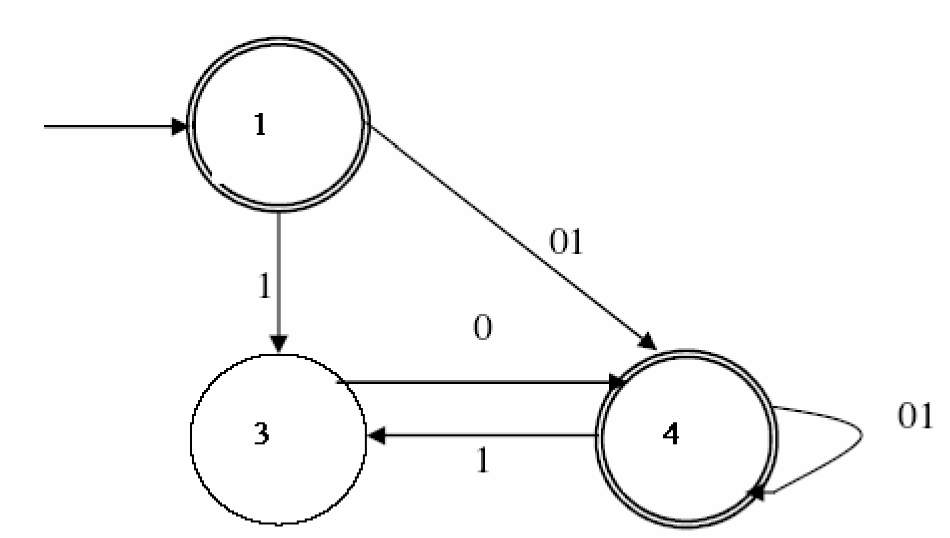
Solution:



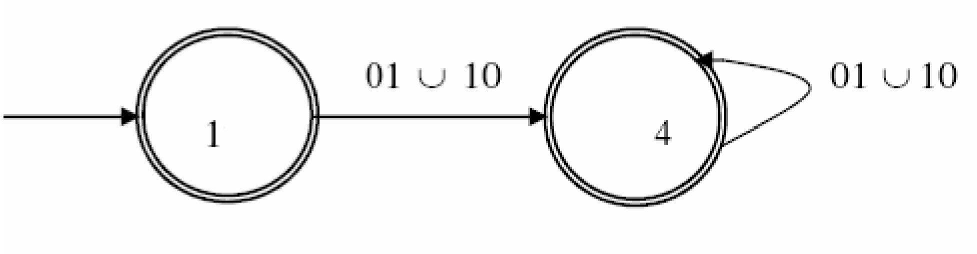
#2. Create the regular expression for the following automaton by eliminating states



Solution
Eliminating state 2:



Eliminating state 3:



So L(M) = λ U (01 U 10) (01 U 10)* or just (01 U 10)*

#3. a) Show that all finite languages are regular

If a language L is finite, we need just create a finite automaton for each of the strings in L and then union these automata (by creating a new start state and λ transitions into each of the automata.

b) Consider the operation *g* on three languages defined as:

g (L1,L2,L3) = L1 U L2 – (L3 ∩ ~L1)

Show that regular languages are closed under the *g* operation.

Regular languages are closed under complement so ~L1 is regular.
Regular languages are closed under intersection so (L3 ∩ ~L1) is regular.
Regular languages are closed under set difference so L1 U L2 – (L3 ∩ ~L1) is regular.

Therefore regular languages are closed under *g*.

#4. Show that it is decidable whether a regular language, L, is empty

Just look at the dfa for L and see if there is a path from the initial state to a final state.

#5. Use the pumping lemma to show the following language is not regular:

$\{0^n 1^m 0^{n+m} \mid n,m \geq 0\}$

If L were regular, then there is a dfa, M, with *k* states accepting L.
Pick $z = 0^k 1^k 0^{2k}$
Then, since z ε L and $|z| \geq k$, by the pumping lemma:

$z = uvw$ with $|uv| \leq k$, length(v) >0 and uv^iw is also in L for all $i \geq 0$.
Thus uv and thus v are all 0's. Say $v = 0^j$.

When i = 0, we have $0^{k-j}1^k 0^{2k}$ which is not the right form for strings in L
Thus this string is not in L and L is not regular.