# EXERCISES ABOUT REGULAR LANGUAGES

**1** Consider the L language over the alphabet {0,1} whose strings are defined by the regular expression 0*1*00*.

a) Draw a ε-NFA for the L language.

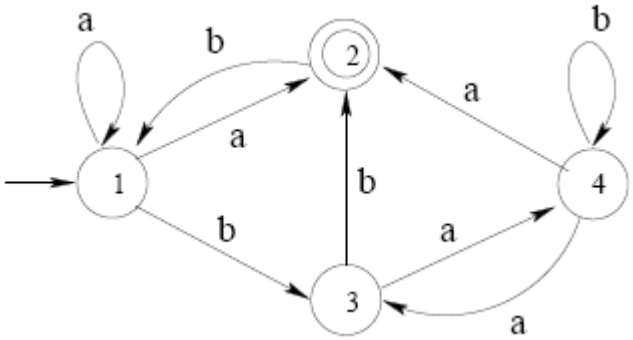
b) Draw an NFA for the L language with only 3 states.

c) Obtain an equivalent DFA.

d) Obtain a DFA for the complement of the language.

e) Obtain a regular exression for the complement of the language.

**2** The following state diagram represents an NFA N = (Q, Σ, δ, q0, F).




a) Show for this automaton, the value of each element in the tupple.

b) Show the transition function using the transition table.

c) Obtain an equivalent DFA.

**3** Write a regular expression for the strings over the alphabet {a,b} with more than 2 a's.

**4** The following equality between languages is true or false? ☚

$L(b^*a^*) \cap L(a^*b^*) = L(a^*) \cup L(b^*)$.

**5** For the DFA given by the transition function below and with $q_1$ as initial state and $q_3$ as final state, determine the regular expressions $R_{ij}^{(0)}$, $R_{ij}^{(1)}$, $R_{ij}^{(2)}$ and obtain from them the regular expression representing the language recognized by the automaton.

$\partial(q1,0)= q2$ $\partial(q1,1)= q3$ $\partial(q2,0)= q1$ $\partial(q2,1)= q3$

$\partial(q3,0)= q2$ $\partial(q3,1)= q1$

**6** For each of the following statements, identify if it is true or false and give a very short justification. ☚

a) Given a language defined by a non-deterministic finite automaton with k states, the equivalent deterministic finite automaton does not have more than 2*k states.

b) The closure language (L*) of a regular language L is a language that includes the empry string.