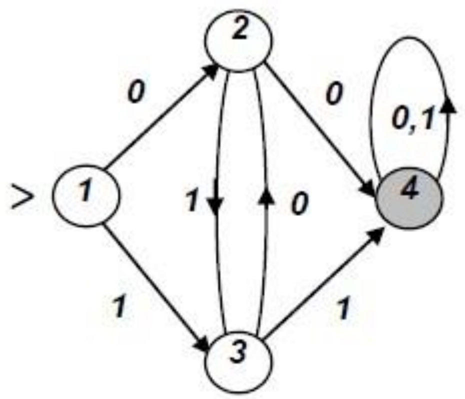
***Homework** #3 due October 31, Tuesday before recitation*

(1) Consider the regular expression ***E = (1+(0+101)*)*.*** Draw an ε-*NFA* accepting the language corresponding to ***E*** above using as little number of states as possible; compute and sketch the equivalent *NFA* without e -transitions ; and finally compute the equivalent *DFA* accepting the language corresponding to ***E*** above.

(2) Convert the following *DFA* to ***RE*** using the state elimination technique. Try to simplify the regular expression using the equivalence relations stated in class.



(3) For following languages,prove or disprove the statement that the language is ***regular***.

(a) $\{ww^R \mid w \in (0+1)^*\}$, where w^R stands for the string ***w*** written in reverse (backwards)

*(b) {**w** | **w** has same number of occurrences of **01** and **10** as substrings}*

(4) Consider the *Deterministic Finite Automata*,

$A = (Q_A, S_A, d_A, q_{0A}, F_A)$ *and* $B = (Q_B, S_B, d_B, q_{0B}, F_B)$

where

$Q_A \cap Q_B =$ Æ , $S_A \cap S_B =$ Æ where Æ stands for the null set.

Let $L_A \subseteq S_A{}^*$ and $L_B \subseteq S_B{}^*$ be the languages accepted by ***A*** and ***B*** respectively and define the interleaved language:

$L_A \,||\, L_B := \{s$ Î $(S_A \cup S_B)^* \mid s\uparrow_A$ Î L_A *and* $s\uparrow_B$ Î $L_B\}$

where $s\uparrow_A$ and $s\uparrow_B$ stand for the projection of s on S_A and S_B respectively, obtained by erasing all the symbols of s in S_B and S_A respectively.

(a) Define the *interleaving product* $A \,||\, B$ of A and B as a *DFA* that accepts the language $L_A \,||\, L_B$

(b) Compute a *DFA* that accepts the language $L = (01)^* \,||\, (ab)^*$

(6) Problems from the main textbook

Exercise 4.1.2 ((b),(c),(h))

Exercise 4.3.3, 4.3.4

Exercises 4.4.2, 4.4.3