

[5] 1. Write a regular expression for the language over $\{0; 1\}$ of strings with an even number of 0's.

Answer:

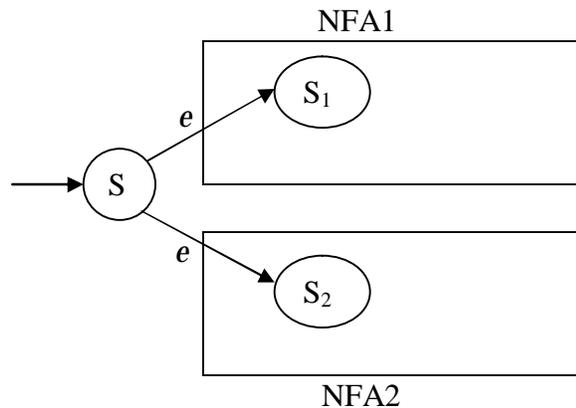
$$(1 \cup (01^*0))^* \text{ or } (1^*01^*01^*)^* \cup 1^* \text{ or } 1^*(01^*0)^*1^* \text{ or } (1^*01^*0)^*1^*$$

Any of the above regular expression contains zero or more pairs of 0's, so a string in the regular expression is also in the language. A string in the language can be the empty string, or string of all 1's, or string with pairs of 0's. Also, there can be any number of 1's before, between, and after the pair of 0's. Hence, the string is also in one of the above regular expression.

(Common error for this question: Some students missed the all 1's string. For example, $(1^*01^*01^*)^*$ doesn't contain all 1's string.)

[5] 2. Give a brief explanation of how to take two NFA's and form a new NFA accepting the union of the languages accepted by the two NFA's.

Answer:



Create a new start state, S , and arrows, which take e as input, from S to the start states of the two NFA's.

Any string in the union of the languages accepted by the two NFA's traverses either or both of the NFA's. Hence, the string will traverse the new NFA by taking one or both of the new arrows.

(Common error for this question: Some students used the method for creating a new DFA accepting the union of the languages accepted by the two DFA's. However, a state in NFA may not have transition arrow that takes input for some letter in the alphabet, which is different from DFA.

I didn't take marks off for this error.)