CS 205, Formal Languages, Automata Theory and Computation
Quiz 2 Solutions, Winter 2020-21
Department of CSE, IIT Guwahati

1. Write a regular expression for the following language over the alphabet 0,1: The set of all strings where every maximal block of consecutive 0's is of even length. A maximal block of 0's is one which is not a substring of a bigger block of 0s. For example, 111 and 00100 are in the language, but 01, 010 and 0100 are not. Your answer should not have length (i.e., the total number of symbols, including parentheses and implicit dots) more than 8. For example, the length of (0+1)* is 6 and of (0+1)*(11+00) is 16, because there are three implicit dots not shown in the expression.

Solution:

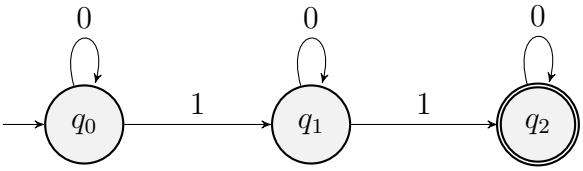
$$(00 + 1)^*$$

2. Write a regular expression for the following language over the alphabet 0,1: The set of all strings not containing 00 as a substring. Your answer should not have length (i.e., the total number of symbols, including parentheses and implicit dots) more than 10. For example, the length of (0+1)* is 6 and of (0+1)*(11+00) is 16, because there are three implicit dots not shown in the expression.

Solution:

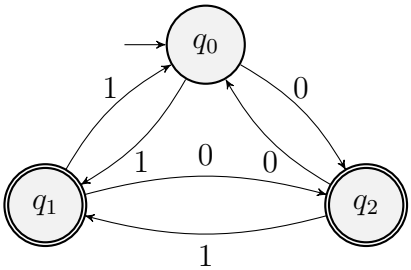
$$((\varepsilon + 0)1)^*$$

3. Describe in English the language over the alphabet 0,1 accepted by the NFA in the figure below.



Solution: The set of all strings containing exactly two 1's.

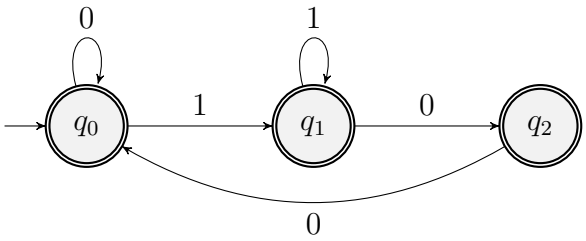
4. Write a regular expression for the language over the alphabet 0,1 accepted by the DFA in the figure below. Your answer should not have more than four + symbols and three * symbols.



Solution: The language accepted is the set of all strings where the maximal block consisting of only 0's or only 1's at the end of the string is of odd length. Here is a regular expression for the language:

$$0 + 1 + (0 + 1)^*(1(00)^*0 + 0(11)^*1)$$

5. Describe in English the language over the alphabet 0,1 accepted by the NFA in the figure below.



Solution: The set of all strings not containing 101 as a substring.