Regular Expressions
Solution

Exercise 1: Write a regular expression and give the corresponding automata for each of the following sets of binary strings. Use only the basic operations.

1. 0 or 11 or 101

   0 | 11 | 101

2. only 0s

   0*

3. all binary strings

   (0|1)*

4. all binary strings except empty string

   (0|1)(0|1)*

5. begins with 1, ends with 1

   1 | (0|1)*|1

6. ends with 00

   (0|1)*00

7. contains at least three 1s

   (0|1)*1(0|1)*1(0|1)*1(0|1)*

8. contains at least three consecutive 1s

   (0|1)*111(0|1)*

9. contains the substring 110

   (0|1)*110(0|1)*

10. doesn't contain the substring 110

    ((0|10)*1)*

11. contains at least two 0s but not consecutive 0s

    1*011*0(11*0)*1*

12. has at least 3 characters, and the third character is 0

    (0|1)(0|1)0(0|1)*

13. number of 0s is a multiple of 3

    1*|(1*01*01*01)*

14. starts and ends with the same character

    (1(0|1)*1)|(0(0|1)*0)

15. starts with 0 and has odd length, or starts with 1 and has even length

    0((0|1)(0|1))*|1(0|1)((0|1)(0|1))*

Exercise 2: For each of the following, indicate how many bit strings of length exactly 1000 are matched by the regular expression: 0(0 | 1)*1, 0*101*, (1 | 01)*.