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

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+011*))*

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.odd length

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

16.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))*

17.length is at least 1 and at most 3

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