

1 Regular Expressions

Give regular expressions for each of the following languages over the alphabet $\{0, 1\}$.

1. All strings containing the substring 000 .
2. All strings *not* containing the substring 000 .
3. All strings in which every run of 0 s has length at least 3.
4. All strings in which 1 does not appear after a substring 000 .
5. All strings containing at least three 0 s.
6. Every string except 000 . [*Hint: Don't try to be clever.*]
7. All strings w such that *in every prefix of w* , the number of 0 s and 1 s differ by at most 1.
8. Any string not in $0^* + 1^*$
- *9. All strings containing at least two 0 s and at least one 1 .
- *10. All strings in which the substring 000 appears an even number of times.
(For example, 0001000 and 0000 are in this language, but 00000 is not.)