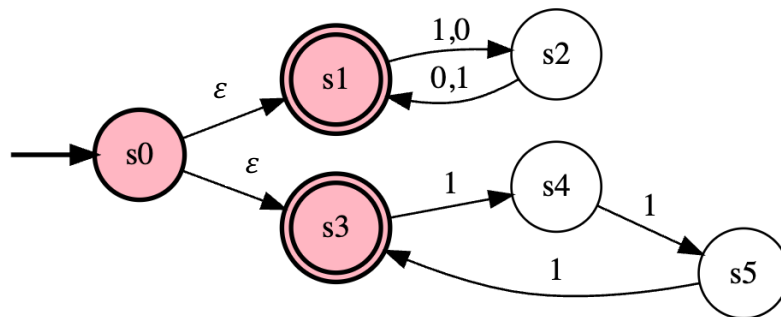


Chapter 1.4 Practice Key

For each of the following languages over the alphabet $\Sigma = \{0, 1\}$, give a regular expression that describes that language.

1. $\{w \mid w \text{ ends with } 001001\}$ $\Sigma^*001001$
2. $\{w \mid w \text{ contains substring } 001\}$ $\Sigma^*001\Sigma^*$
3. $\{w \mid w \text{ is all strings except } 001\}$ $\varepsilon \cup 1\Sigma^* \cup 01\Sigma^* \cup 000\Sigma^* \cup 001\Sigma^+ \cup 0 \cup 00$
4. $\{w \mid w \text{ is all strings containing two 0s followed by a 1 (It does not have to be consecutive, just in that order.)}\}$ $\Sigma^*0\Sigma^*0\Sigma^*1\Sigma^*$
5. $\{w \mid w \text{ has only two 0s and has at least one 1}\}$ $1^*01^*01^+ \cup 1^*01^+01^* \cup 1^+01^*01^*$
6. $\{w \mid w \text{ where every 0 is followed by at least two 1s}\}$ $1^*(011^+)^*$
7. $\{w \mid w \text{ has an even length OR have length divisible by 3 and consist of only 1s}\}$
 $(\Sigma\Sigma)^* \cup (111)^*$

Draw the state diagram for an NFA accepting the language in #7.



The shading is irrelevant.