Aufgabe 1 (Sipser, exercise 1.7, part a)

In der Vorlesung wurde gezeigt, daß die Klasse der regulären Sprachen unter der Operation der Konkatenation abgeschlossen ist. Verwenden Sie die für die Herleitung benutzte Konstruktion, um das Zustandsdiagramm eines nichtdeterministischen endlichen Automaten anzugeben, der die Konkatenation der Sprachen

(a) $\{w|\,$ die Länge von w ist höchstens 5$\}$ und

(b) $\{w|\,$ jede ungerade Position von w ist eine 1$\}$

erkennt.

Aufgabe 2 (Sipser, exercise 1.5, part e, g)

Give NFAs with the specified number of states recognizing each of the following languages.

(a) The language $0^*1^*0^*0$ with three states.

(b) The language 0^* with one state.

Aufgabe 3 (Sipser, exercise 1.13)

Give regular expressions generating the following languages.

(a) $\{w|\,w$ begins with a 1 and ends with a 0$\}$.

(b) $\{w|\,w$ contains at least three 1s$\}$.

(c) $\{w|\,w$ contains the substring 0101, i.e., $w = x0101y$ for some x and $y\}$.

(d) $\{w|\,w$ has length at least 3 and its third symbol is a 0$\}$.

(e) $\{w|\,w$ starts with 0 and has odd length, or starts with 1 and has even length$\}$.

(f) $\{w|\,w$ doesn't contain the substring 110$\}$.

(g) $\{w|\,$the length of w is at most 5$\}$.

(h) $\{w|\,w$ is any string except 11 and 111$\}$.

(i) $\{w|\, \text{every odd position of } w \text{ is a } 1\}$.

(j) $\{w|\, w \text{ contains at least two 0s and at most one 1}\}$.

(k) $\{\varepsilon, 0\}$.

(l) $\{w|\, w \text{ contains an even number of 0s, or exactly two 1s}\}$.

(m) The empty set.

(n) All strings except the empty string.