

# Discrete Event Systems

## Exercise Sheet 3

### 1 Pumping Lemma [Exam]

Is the following language regular? Prove your claims!

$$L = \{0^a 1^b 0^c 1^d \mid a, b, c, d \geq 0 \text{ and } a = 1, b = 2 \text{ and } c = d\}$$

### 2 Deterministic Finite Automata [Exam]

Transform the NFA  $A$  in Figure 1 into an equivalent DFA, while assuming  $\Sigma = \{0, 1\}$ . (*Hint:* Only construct states which are necessary!)

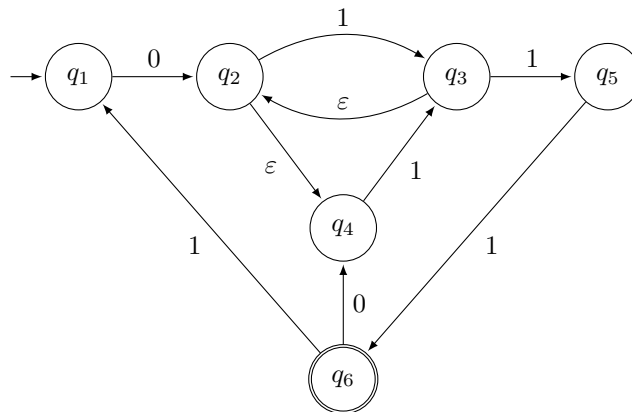


Figure 1: NFA  $A$ .

### 3 Transforming Automata [Exam]

Consider the DFA  $B$  in Figure 2 over the alphabet  $\Sigma = \{0, 1\}$ . Give a regular expression for the language  $L$  accepted by the automaton  $B$ . If you like, you can do this by ripping out states as presented in the lecture.

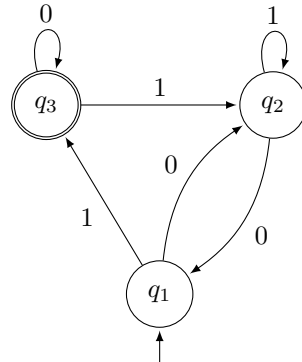


Figure 2: DFA  $B$ .

### 4 Pumping Lemma

Is the following language regular? Prove your claims!

$$L = \{1^n 02^n \mid n \geq 0\}$$