Problems Solved:

6	7	8	9	10

Name:

Matrikel-Nr.:

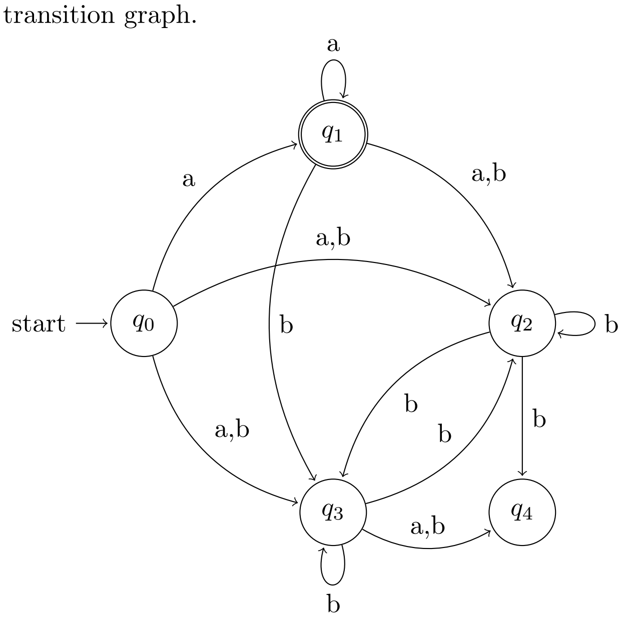
Problem 6. Let L be the set of all strings $x \in \{a, b\}^*$ with $|x| \geq 3$ whose third symbol from the right is b. For example, *babaa* and *bbb* are elements of L, but *bb* and *baba* are not.

1. Construct a NFSM N such that $L(N) = L$. (4 states are sufficient.)
2. Construct a DFSM D such that $L(D) = L$. (8 states are sufficient.)

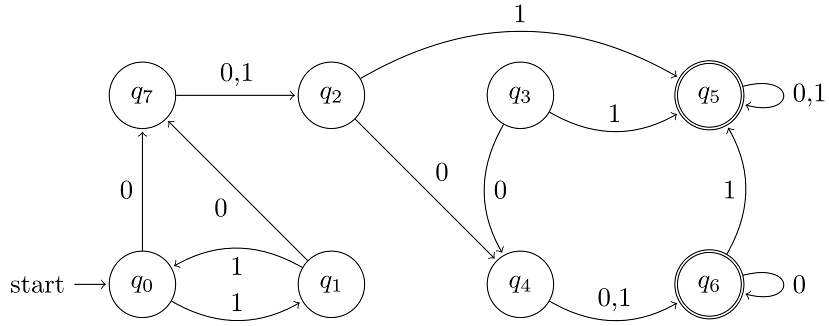
Problem 7. Construct a deterministic finite state machine M over $\Sigma = \{0, 1\}$ such that $L(M)$ consists of all words that do not contain the string 01. *Hint:* Start by constructing a nondeterministic finite state machine N that recogizes the words that *do* contain the string 01. Proceed by converting your nondeterministic machine N to a deterministic machine D that accepts the same language. Now you are left with the task of coming up with a machine M whose language is precisely the complement of the language of D. This can be done by a small modification of D.

Problem 8. Construct explicitly a deterministic finite state machine $D = (Q, \Sigma, \delta, S, F)$ with alphabet $\Sigma = \{a, b, c\}$, such that the words of $L(D)$ contain an even number of a's, an even number of b's, and an even number of c's. For example, *aacc*, *ccaaccbbaa*, *aaaabb*, *abcabc*, *abba* are from $L(D)$ and *babc*, *cabab*, *caacbaabba* are not from $L(D)$.

Problem 9. Convert the following NFA to DFA. It suffices to give the resulting transition graph.



Problem 10. Let the DFSM $M = (Q, \Sigma, \delta, q_0, F)$ be given by $Q = \{q_0, q_1, q_2, q_3, q_4, q_5, q_6, q_7\}$, $\Sigma = \{0, 1\}$, $F = \{q_5, q_6\}$ and the following transition function $\delta : Q \times \Sigma \to Q$:



Construct a minimal DFSM D such that $L(M) = L(D)$ using Algorithm MINIMIZE. (cf. Section 2.3 *Minimization of Finite State Machines*)