Problems Solved:

6	7	8	9	10

Name:

Matrikel-Nr.:

Problem 6. Let L be an arbitrary finite set of strings over $\{0,1\}$. Is it always possible to construct a non-deterministic finite state machine M with $L(M) = L$? If yes, give the principle of the construction and demonstrate it by some example. Furthermore, is it also always possible to construct a d deterministic finite state machine M' with $L(M') = L$? If yes, how?

Problem 7. Construct a deterministic finite state machine for each of the following two languages:

1. the language L_1 of all strings over $\{a, d, n\}$ that contain *and* as a substring.
2. the language L_2 of all strings over $\{d, e, n\}$ that end up with the string *end*.

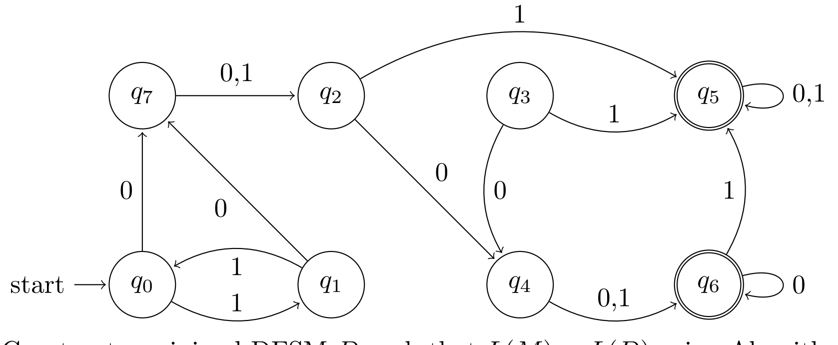
Define each machine formally and draw its transition graph.

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 odd number of b's, and an even number of c's. For example, *aabcc*, *cacba*, *aabaabb* are from $L(D)$ and *babc*, *ccabab*, *caacbaabba* are not from $L(D)$.

Problem 9. Let $N = (Q, \Sigma, \delta, S, F)$ be the NFSM given by $Q = \{q_0, q_1, q_2\}$, $\Sigma = \{0, 1\}$, $S = \{q_0\}$, $F = \{q_1, q_2\}$, and the transition function $\delta : Q \times \Sigma \to P(\Sigma)$ where $\delta(q_0, 0) = \{q_0, q_1\}$, $\delta(q_0, 1) = \{q_0, q_2\}$, and $\delta(q, \sigma) = \emptyset$ for $q \in \{q_1, q_2\}$ and all $\sigma \in \Sigma$.

1. Draw the transition graph of the NFSM.
2. Construct a DFSM D such that $L(N) = L(D)$. *H*int: Use the Subset Construction, cf. Section 2.2 in the lecture notes.

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*)