# Quiz Section 9: Minimization, NFAs, Subset Construction, Irregularity

Task 1 – DFAs & Minimization

Minimize the following DFA.

For each step of the algorithm, write down the groups of states, which group was split in that step and the reason for splitting that group. At the end, write down the minimized DFA, with each state named by the set of states of the original machine that it represents (e.g., "B, C" if it represents B and C).
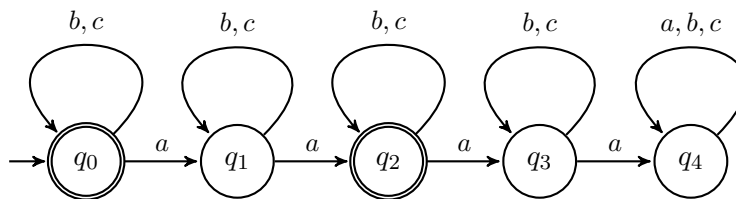
Task 2 – NFAs

**a)** What language does the following NFA accept?
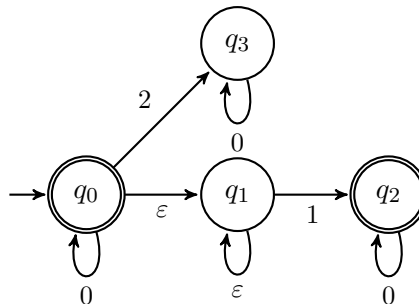
b) Create an NFA for the language "all binary strings that have a 1 as one of the last three digits".

Task 3 – RE to NFA

Convert the regular expression "$(11 \cup (01)^*)00$" to an NFA using the algorithm from lecture. You may skip adding ε-transitions for concatenation if they are obviously unnecessary, but otherwise, you should *precisely* follow the construction from lecture.

Task 4 – NFAs to DFAs

a) Convert the following NFA to a DFA for the same language:
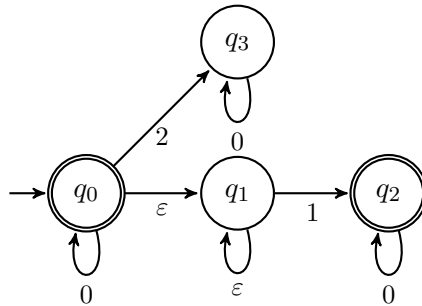
b) Convert the following NFA to a DFA for the same language:
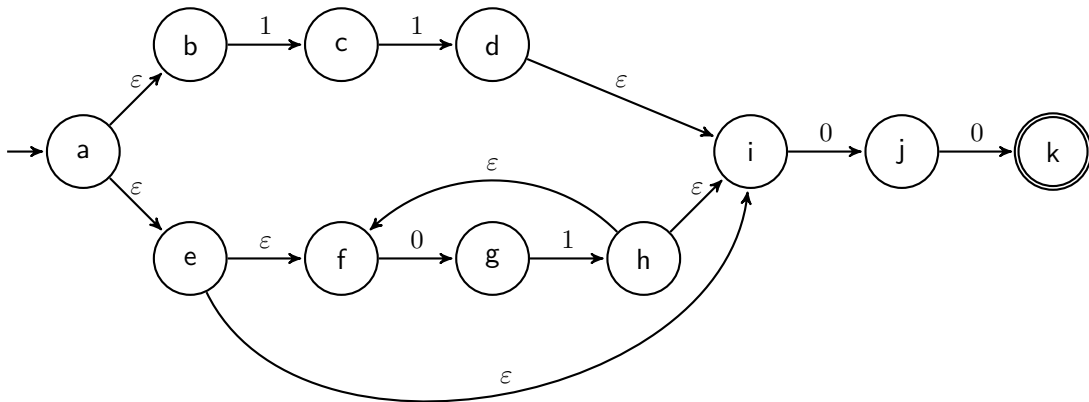
Task 5 – Irregularity

a) Let $\Sigma = \{0, 1\}$. Prove that $\{0^n 1^n 0^n \ : \ n \geqslant 0\}$ is not regular.

b) Let $\Sigma = \{0, 1, 2\}$. Prove that $\{0^n (12)^m \ : \ n \geqslant m \geqslant 0\}$ is not regular.