Discrete Event Systems
Exercise Sheet 3

1 Pumping Lemma [Exam]
Is the following language regular? Prove your claims!

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

2 Deterministic Finite Automata [Exam]
Transform the NFA \( A \) in Figure 1 into an equivalent DFA using the powerset construction presented in the lecture, while assuming \( \Sigma = \{0, 1\} \). (Hint: Only construct states which are necessary!)

![Figure 1: NFA A.](image-url)
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 $B$.](image)