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COS 210 Worksheet 3

- This worksheet consists of **4 questions** for a total of **12 marks**.

Question 1 ..... (3 marks)

The language A is defined over the alphabet $\Sigma = \{a, b, c\}$ with

$$\text{A} = \{w : \text{there exists a symbol in } \Sigma \text{ that appears at most twice in } w\}.$$

Draw a non-deterministic finite automaton N with $L(N) = A$.

Question 2 ..... (2 marks)

The language B is defined over the alphabet $\Sigma = \{a, b\}$ with

$$B = \{u_1 u_2 \dots u_k : k \geq 0 \text{ and } u_i \in \{bab, ba\} \text{ for all } i \in 1, 2, \dots, k\}.$$

Hence, B is the language of arbitrary concatenations of bab and ba. Draw a non-deterministic finite automaton N with $L(N) = B$. Your automaton shall have three states. (Note that the transitions of your automaton must be labelled with a or b or ϵ, but NOT with bab or ba.)

Question 3 ..... (3 marks)

Draw a deterministic finite automaton D over $\Sigma = \{a, b\}$ with $L(D) = B$ where B is the language from Question 2. Your automaton shall have five states.

Question 4 ..... (4 marks)

Convert the NFA N below to a DFA $D = (Q', \Sigma, \delta', q', F')$ using the approach from Lecture 7 and textbook Section 2.5. You are required to explicitly provide the elements of the 5-tuple $(Q', \Sigma, \delta', q', F')$ that describes the DFA D. Provide the transition function as a table. Do not draw the DFA.