Let $L, L'$ be languages (events) over finite alphabets $S, S'$. Define the *concatenation* $LL'$ of the languages $L$ and $L'$. [2 marks]

What are the other regular operators on languages over finite alphabets? [You do not need to give a detailed definition.] Explain what is meant by a *regular language* $L$ over a finite alphabet $S$. [3 marks]

What is meant by a *non-deterministic finite automaton* (NDFA) over a finite alphabet $S$? Given such an NDFA $M$, let $i$ be the initial state, and $A$ be the set of accepting states. Define the *language $L$ accepted by $M$* (equivalently, the *event $E$ recognised by $M$*). [4 marks]

Show how to define a deterministic finite automaton (DFA) $\overline{M}$ that also accepts $L$. [3 marks]

Suppose that languages $L, L'$ over alphabets $S, S'$ are accepted by DFA $M, M'$. Construct an NDFA $M_c$ that accepts their concatenation $LL'$. (*) [4 marks]

Let $L$ be a regular language over a finite alphabet $S$. Outline the proof that $L$ is accepted by some DFA $M$. [You may assume results equivalent to (*) for the other regular operators.] [4 marks]