

Midterm COMP 2805

Fall 2004

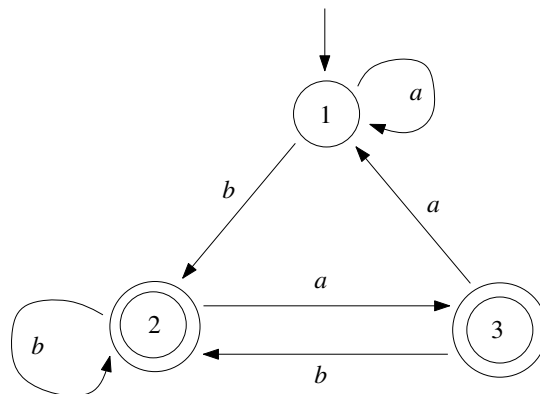
October 26, 2:30–4:00 pm

Question 1: (25 marks) Give the state diagram of a deterministic finite automaton (DFA) that accepts the language A defined as

$$A = \{w \in \{0,1\}^* : \text{the last two symbols of } w \text{ are } 01\}.$$

Explain why your DFA is correct. In particular, give the meaning of each state that you use.

Question 2: (25 marks) Convert the following deterministic finite automaton (DFA) to a regular expression. Show your work.



Question 3: (15+10 marks) Let A and B be regular languages over the alphabet Σ .

(3.1) Prove that the complement \overline{A} of A is also a regular language.

(3.2) Prove that $A \cap B$ (i.e., the intersection of A and B) is also a regular language.

(Hint: You may use any result that was proven in class. Observe that $A \cap B = \overline{\overline{A} \cup \overline{B}}$.)

Question 4: (25 marks) Let A be a regular language over the alphabet Σ . We have shown in class that there exists a regular expression R that describes the language A .

Explain how a regular expression can be obtained that describes the complement \overline{A} of A . (You may use any result that was proven in class; you may also use the result in Question 3.1.)