

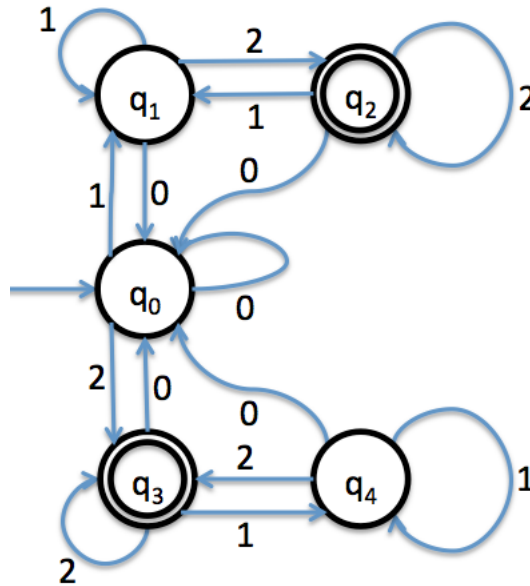
# CSCI3136

## Assignment 3

Instructor: Alex Brodsky

Due: 3:00pm, Monday, February 3, 2014

1. Consider the following DFA  $M$ :



- (a) **[10 marks]** Minimize  $M$  and state what language it recognizes.
  - (b) **[5 marks]** Suppose that we changed  $M$ , such that state  $q_4$  was an accepting state and state  $q_3$  was not. How would the minimal DFA change?
  - (c) **[5 marks]** What would be the size of a minimal DFA that recognized the complement of the language recognized by  $M$ . Justify your answer.
2. **[10 marks]** Is the language  $L = \{\sigma \in \{a^*\} \mid |\sigma| \text{ is divisible by } 2^n, n \geq 1\}$  regular? Be sure to prove your answer.
  3. **[10 marks]** Prove that the language  $L = \{a^{2^n} \mid n \geq 0\}$  is not regular.
  4. **[10 marks]** Prove that the language  $L = \{a, b\}^* \mid |\sigma|_a < |\sigma|_b\}$  is not regular. Note: The notation  $|\sigma|_a$  means the number of  $a$ s in  $\sigma$ .
  5. **[Bonus 10 marks]** Show that for any  $L \subset \{0\}^*$  the language  $L^*$  is regular. (J. Hopcroft and J. Ullman, "Introduction to Automata Theory, Languages, and Computation, 1979).

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Winter 2014

Student Name	Login ID	Student Number	Student Signature

	Mark
Question 1a	/10
Question 1b	/5
Question 1c	/5
Question 2	/10
Question 3	/10
Question 4	/10
Question 5 (Bonus)	/10
<b>Total</b>	<b>/50</b>

Comments:

Assignments are due by 3:00pm on the due date before class and must include this cover page. Assignment *must* be submitted into the assignment boxes on the second floor of the Goldberg CS Building (by the elevators).

Plagiarism in assignment answers will not be tolerated. By submitting their answers to this assignment, the authors named above declare that its content is their original work and that they did not use any sources for its preparation other than the class notes, the textbook, and ones explicitly acknowledged in the answers. Any suspected act of plagiarism will be reported to the Faculty's Academic Integrity Officer and possibly to the Senate Discipline Committee. The penalty for academic dishonesty may range from failing the course to expulsion from the university, in accordance with Dalhousie University's regulations regarding academic integrity.