CSCI 3136
Assignment 3

Summer 2017

Instructor: Tami Meredith

Due: 10:35am, Wednesday, June 7, 2017

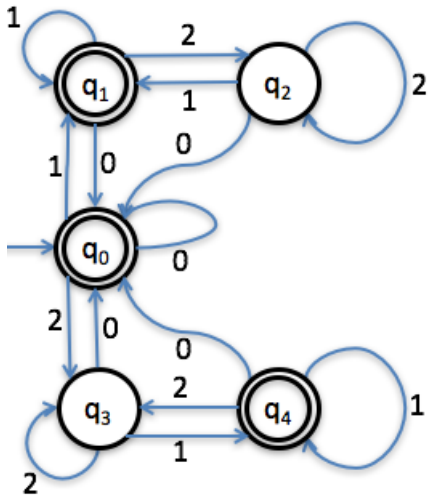
Student Name	Login ID	Student Number	Student Signature

	Mark
Question 1	/10
Question 2	/10
Question 3	/10
Question 4	/10
Total	**/50**

Assignments are due by 10:35am at the start of the class class and must include this cover page. Assignment *must* be submitted to the course instructor. Electronic submission is not permitted without prior permission.

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 or textbooks. Any other sources (e.g., the web) must be acknowledged in the answers. Any suspected act of plagiarism will be reported to the Facultys 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 Universitys regulations regarding academic integrity.

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_2 was an accepting state and state q_1 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 $L = \{\sigma \in \{a^*\} \mid |\sigma| \textit{ is divisible by } n^2, \textit{for some } n \geq 1\}$ regular? Be sure to prove your answer.

3. **[10 marks]** Prove that the language $L = \{a^{n^2} | n \geq 0\}$ is not regular.

4. **[10 marks]** Prove that the language $L = \{\sigma \in \{a, b, c\}^* || \sigma|_a >= |\sigma|_b >= |\sigma|_c\}$ is not regular. Note: The notation $|\sigma|_a$ means the number of as in σ.