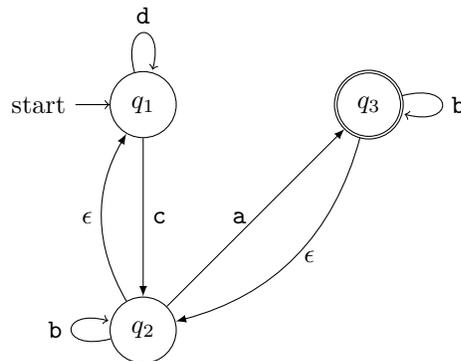


St. Francis Xavier University
Department of Computer Science
CSCI 356: Theory of Computing
Assignment 2
Due October 10, 2025 at 11:30am

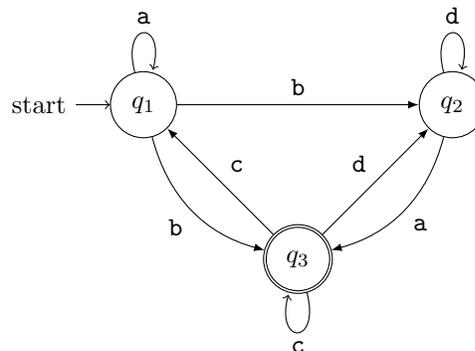
Assignment Regulations.

- This assignment must be completed individually.
- Please include your full name and email address on your submission.
- You may either handwrite or typeset your submission. If your submission is handwritten, please ensure that the handwriting is neat and legible.

- [6 marks] 1. Given the following nondeterministic finite automaton \mathcal{M} with epsilon transitions, convert it to an equivalent (non)deterministic finite automaton \mathcal{M}' without epsilon transitions. Show all your work in addition to giving the converted finite automaton.



- [6 marks] 2. Given the following nondeterministic finite automaton \mathcal{M} , convert it to an equivalent deterministic finite automaton \mathcal{M}' . Show all your work in addition to giving the converted finite automaton.



- [8 marks] 3. Consider the following regular expression over the alphabet $\Sigma = \{a, b, c\}$:

$$(ab^*(a+c))^*.$$

Convert this regular expression to a finite automaton recognizing the same regular language. Show all your work in addition to giving the finite automaton. You do not need to remove epsilon transitions or determinize the finite automaton.

- [5 marks] 4. Let $\Sigma = \{a, b, c\}$. Using the pumping lemma for regular languages, prove that the following language is not regular:

$$L = \{a^{4i+2}b^k c^{2i+1} \mid i \geq 0 \text{ and } k \geq 0\}.$$