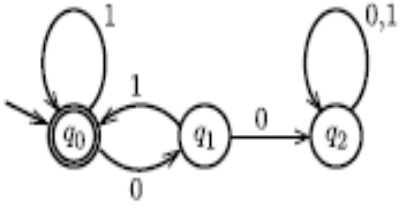
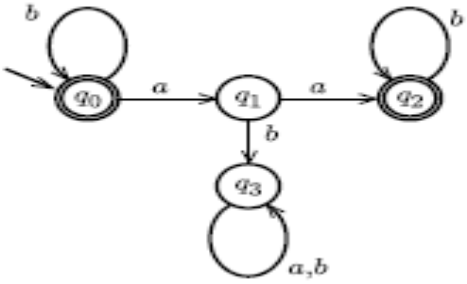
Concordia University
Department of Computer Science and Software Engineering
COMP 335: Introduction to Theoretical Computer Science
Fall 2017
Assignment 1
Evaluation: 30 pts
(3% of your final grade)
Due date and time: Thursday September 28th 2017 at 23:59

Question 1 (5 pts)

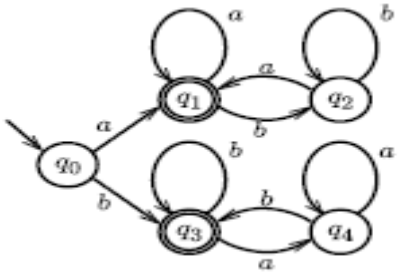
Describe concisely the language accepted by each of the following automata:



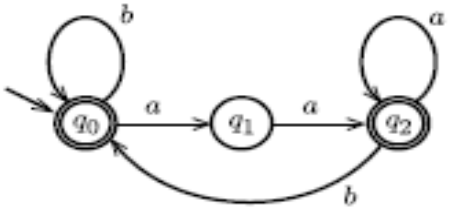
a)



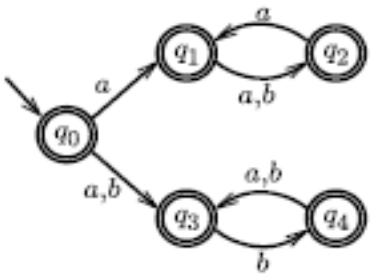
b)



c)



d)



e)

Question 2 (5 pts)

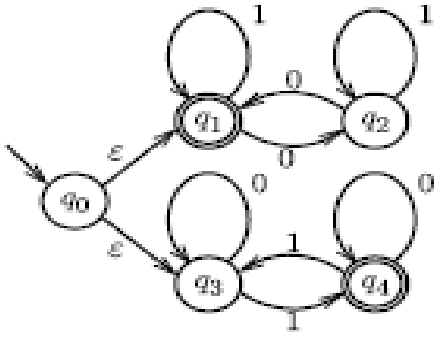
a) For each of the following languages over the alphabet {0,1}, give a deterministic finite automaton that accept the languages.

1) {*w*: *w* contains 101 as a substring}
2) {*w*: every 1 in *w* is preceded and is followed by at least one 0}

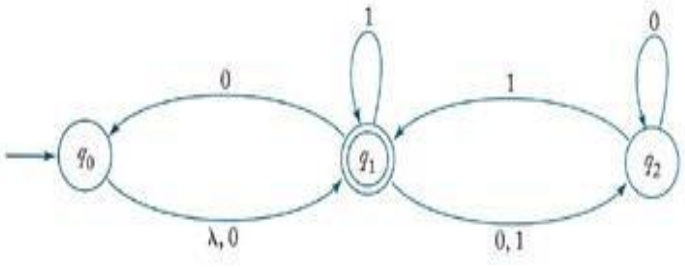
b) For the language (1) in part (a) above, give a nondeterministic finite automaton.

Question 3 (5 pts)

Consider the NFA M given below:
a) Informally describe the language accepted by M.
b) Transform M into an equivalent DFA.

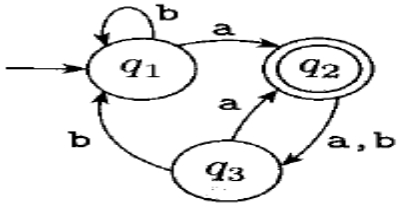


c) Convert the following NFA into an equivalent DFA:

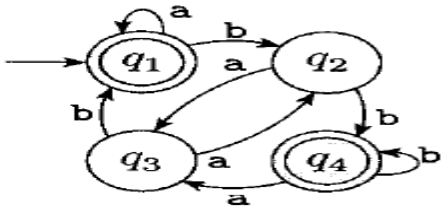


Question 4 (5pts)

Give a formal description of the finite states machines M1 and M2 shown below.



M_1



M_2

Question 5 (5pts)

For each of the following languages over the alphabet {a, b}, give a DFA for the complement of the language.
a) {w: w does not contain the string ab}
b) {w: w does not contain the substring baba}

Question 6: (5pts)

Give state diagrams of NFAs with the specified number of states recognizing each of the following languages. In both parts (a) and (b), the alphabet is {0, 1}.
a) The language {w: w ends with 00} by an NFA with 3 states
b) The language 1*(001*)* by an NFA with 3 states

Submission:

- **Assignment must be done individually (no groups are permitted).**
  - Your file should be called *a#_studentID*, where # is the number of the assignment and *studentID* is your student ID number. For example, for the first assignment, student 123456 would submit a pdf file named a1_123456.pdf
- **Assignments** must be submitted **via Moodle under assignment#1 submission Box.** Electronic submission can be in PDF or scans of clear handwriting.

Note: **Assignment not submitted by the due date and in the correct format will not be graded – NO EXCEPTIONS!!!!**