15-453 Formal Languages, Automata, and Computation

Practice Midterm

February 14, 2000

Name: ______________________________

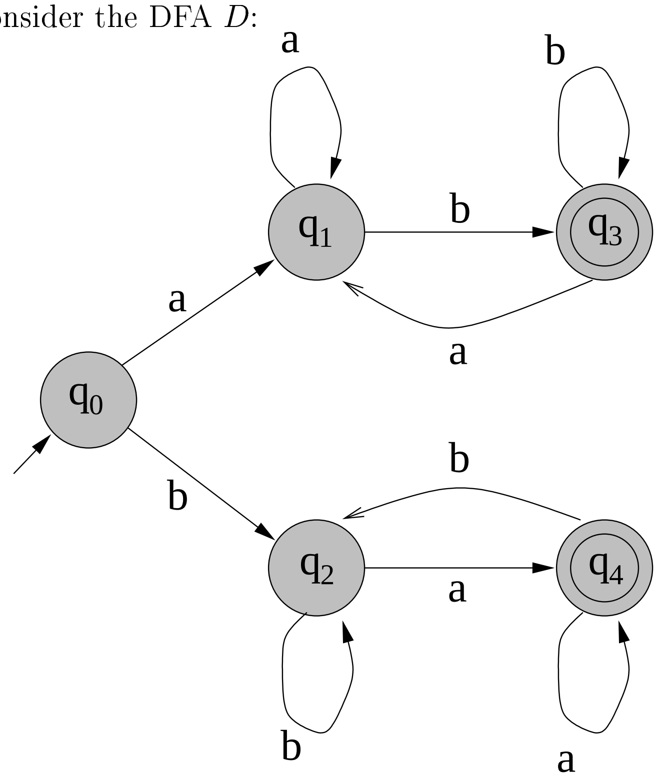
Andrew ID: ______________________________

- This is a closed book exam; only 1 sheet of notes is permitted.
- Write your answer legibly in the space provided.
- You have 50 minutes for this exam.
- This exam consists of 2 questions worth 50 points each, plus a third question for extra credit.
- The extra credit is recorded separately, so make sure you have answered questions 1 and 2 correctly before moving on to question 3.

Problem 1	Problem 2	Total	Extra Credit
50	50	100	30

Problem 1 (50 pts)

Consider the DFA D:



Let L be the language recognized by D.

a. (25 pts) Write out a regular expressions generating L. You may, but need not use the procedure for converting a DFA into regular expressions presented in class.

b. (25 pts) Write an NFA N with fewer states that accepts L. You only need to show the state diagram for N.

Problem 2 (50 pts)

Consider the language

$$L = \{a^i b^j c^k \mid i, j, k \geq 0 \text{ and } i = j \text{ or } j = k\}$$

a. (20 pts) Show a PDA P recognizing L.

b. (30 pts) Using the pumping lemma for regular languages, prove carefully that L is not regular.

Problem 3 (30 points extra credit)

Is the language $\{w \mid w \text{ is a permutation of } 0^n1^{2n} \text{ for some } n \geq 0\}$ context-free? Prove your answer!