

CS323 Assignment 2

1 Requirements

You are expected to complete all required homework exercises and encouraged to complete the optional ones. For submission, please put all your answers in a single PDF file and submit it via the assignment channel on SAKAI. The name of the file should follow the format “**studentID_A#**” (e.g., 30003554_A2). **The submission deadline is 11:55 PM, October 16, 2022.** Late submissions are allowed within one week after the deadline (grace period). If you submit your assignment during the grace period, your score will be 80% of the score you could get if the submission was made in time. Assignment submitted after the grace period will not be graded, meaning that you will get a zero for the assignment.

2 Required Exercises (100 points)

Exercise 1: Design NFAs to recognize each of the following regular languages. **Is each of the NFAs designed by you also a DFA?** The alphabet contains only two symbols: a and b.

1. $L((a|b)^*b)$ [10 points]
2. $L(((\epsilon|a)^*b)^*)$ [10 points]
3. $L((a|b)^*a(a|b)(a|b))$ [10 points]
4. $L(a^*ba^*ba^*ba^*)$ [10 points]

Exercise 2: Convert the following regular expressions to NFAs using the Thompson’s Construction Algorithm (Algorithm 3.23 in the dragon book). Please put down the detailed steps and **DO NOT** optimize the NFAs.

1. $((\epsilon|a)^*b)^*$ [10 points]
2. $(a|b)^*a(a|b)(a|b)$ [10 points]
3. $a^*ba^*ba^*ba^*$ [10 points]

Exercise 3: Convert the NFAs in Exercise 2 to DFAs using the **Subset Construction Algorithm** (Algorithm 3.20 in the dragon book). Please put down the **detailed steps**. [30 points in total; 10 points for each correct conversion]