Assignment 2

1 Requirements

You are expected to complete all required exercises and encouraged to complete the optional ones. For submission, please put all your answers in a PDF file. The name of the file should follow the format **"studentID_assignmentNumber"** (e.g., 2021111554_assignment2). **The submission deadline is 11:59 PM, October 8, 2023. Please ensure that your answers (including NFAs and DFAs) are clear enough, otherwise it will affect the evaluation. It is recommended to use drawing software to draw NFAs and DFAs.**

2 Required Exercises (100 points)

Exercise 1: Design NFAs and DFAs to recognize each of the following regular languages. Detailed steps can be omitted.

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.

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]

3 Optional Exercises (20 bonus points)

Exercise 1: Minimize the number of states of the DFAs you have built for regular expressions 2 and 3 in **Exercise 2** using the **State-Minimization Algorithm** (Algorithm 3.39 in the dragon book). Please put down the detailed steps. [10 points for each correct minimization process]