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. $L(\texttt{(a|b)*b})$ [10 points]
2. $L(\texttt{((}\epsilon\texttt{|a)*b)*})$ [10 points]
3. $L(\texttt{(a|b)*a(a|b)(a|b)})$ [10 points]
4. $L(\texttt{a*ba*ba*ba*})$ [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. $\texttt{((}\epsilon\texttt{|a)*b)*}$ [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]