Theory of Computation '23
Problem Set 1

Problem 1. Recall the theorem we proved in the lecture - If a language A is recognized by an NFA, then A is regular. The way we proved this is as follows. Given an NFA M that recorgnizes A, we constructed a DFA which recognizes exactly A. We had left out the part where you need to take care of the ε-transitions. Modify the construction to accomodate this. What kind of states do you think you will add to your DFA for this? What will be the transitions etc...

Problem 2. Give a DFA over the alphabet a, b for each of the following:

a. Accepts strings which do not contain aaa as a substring.

b. Accepts all strings which contain aab as a substring but do not contain aaa as a substring.

c. Accepts $L = \{w \in \{a, b\} | w$ contains at least two $a's$ and at most one $b's\}$

d. Accepts all strings that are binary representations of numbers that are 3(mod 5), that is leaves a remainder 3 when divided by 5.

Problem 3. Give a NFA for the following

$$L = \{wc | w \in \{0, 1, 2\}^\star, c \in 0, 1, 2 \text{ and c occurs in w } \}$$

Problem 4. For language L in (c) above, what is the language $L \circ L$?