Regular Languages Question Set

1. (R1) State whether the finite automaton given below accepts or rejects each of the stated strings.

- bbaaaba
- baabab
- aabaa

2. (R2) State whether the regular expression given below describes each of the stated strings.

\[(a|b)bb^* (aaba)^*\]

- abaab
- bbbbb
- \(\epsilon\) (the empty string)

3. (R3) Create a finite automaton that recognizes the language described by the following regular expression.

\[(a|b)^* cbc^*\]

4. (R4) Create a regular expression which describes the language of the finite automaton below.

5. (R5) Convert the following NFA to a DFA using the construction technique discussed in class and in the textbook.
6. (R6) Describe the language the finite automaton given below recognizes.

![Finite Automaton Diagram]

7. (R7) Give a description of the language described by the following regular expression.

$$b^* ((ab)b^*)^*$$

8. (R8) Construct a finite automaton that recognizes the language given below. Assume $$\Sigma = \{a, b\}$$.

$$L_1 = \{w \mid w \text{ contains at most } 2 \text{ } a\text{'s }\}$$

9. (R9) Give an NFA which recognizes the language described below.

$$L_2 = \{w \in \{0, 1\} \mid w \text{ ends with } 01010\}$$

10. (R10) Give a regular expression which describes the language given below.

$$L_3 = \{w \in \{a, b\}^* \mid \|w\| = 4n, n \geq 0\}$$

11. (R11) Prove the following language is regular.

$$L_4 = \{w \in \{a, b\}^* \mid \text{every } a \text{ in } w \text{ is followed by at least } 2 \text{ } b\text{'s }\}$$

12. (R12) Prove the following language is not regular using the pumping lemma for regular languages.

$$L_5 = \{w \in \{a, b\}^* \mid w \text{ is a palindrome } (w = w^R)\}$$

- $$s = \underline{\hspace{1cm}}$$
- Inferences about $$y$$:
  - Consider $$s' = xy^iz$$, for $$i = \underline{\hspace{1cm}}$$ (so $$s' = \underline{\hspace{1cm}}$$)
  - $$s' \notin L_3$$ because: