Intro to Computer Science Theory: Homework 6

Alvin Lin and Joshua Cotton

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Problem 1

Give regular expressions for the following languages:

1. The set of all strings over $\{0, 1\}$ that begin and end with the same character.

$$(0(0 \cup 1)^*0) \cup (1(0 \cup 1)^*1) \cup 0 \cup 1$$

2. The set of all strings over $\{a, b\}$ containing at most two occurrences of the substring "aa" (where "aaa" is considered two occurrences).

$$\left((ab \cup b)^* aa (b \cup ba)^* b^+ aa (b \cup ba)^* \right) \cup \left((ab \cup b)^* aaa (b \cup ba)^* \right)$$

3. The set of strings over $\{a, b\}$ where the number of b's is even and the number of a's is odd.

$$(a \cup bab \cup bba \cup baaab \cup baaba \cup bbbab \cup bbbba)(bb \cup aa \cup abab \cup baba \cup abba \cup baab)^*$$

4. The set of all strings over $\{0, 1, 2\}$ that contain each character at least once.

$$\left(0(0 \cup 1 \cup 2)^*1(0 \cup 1 \cup 2)^*2\right) \cup$$

$$\left(0(0 \cup 1 \cup 2)^*2(0 \cup 1 \cup 2)^*1\right) \cup$$

$$\left(1(0 \cup 1 \cup 2)^*0(0 \cup 1 \cup 2)^*2\right) \cup$$

$$\left(1(0 \cup 1 \cup 2)^*2(0 \cup 1 \cup 2)^*0\right) \cup$$

$$\left(2(0 \cup 1 \cup 2)^*0(0 \cup 1 \cup 2)^*1\right) \cup$$

$$\left(2(0 \cup 1 \cup 2)^*1(0 \cup 1 \cup 2)^*0\right)$$

5. The set of all strings over $\{0, 1\}$ where the number of "01" substrings equals the number of "10" substrings.

No idea

Problem 2

For each regular expression, list all the strings of length three in the language described by the expression.

1. $b^*(abb^*)^*a^*$

$$abb, bbb, bba, baa, aaa$$

2. $b^*(ab)^*a^*$

$$bab, aba, bbb, bba, baa, aaa$$

3. $0^*(1 \cup 01)^*1^*$

$$000, 001, 011, 111, 101$$

4. $(b^* \cup a^*)(b^* \cup a^*)(b^* \cup a^*)$

$$aaa, aab, aba, abb, baa, bab, bba, bbb$$

5. $0^*1(0^*10^*1)^*0^*$

$$001, 010, 011, 100, 101, 110$$

If you have any questions, comments, or concerns, please contact me at
alvin@omgimanerd.tech