

Quinn Roemer

CISP - 440

Assignment 14

12/13/2018

Part 0 - Regular Expressions.

Description:

The goal for this assignment is to demonstrate my knowledge on regular expressions. To do this, I was to perform a number of practice problems provided by the professor on a separate worksheet. Note, each question will be listed above the problem.

Problem 1:

For problems A through I, find regular expressions describing exactly each of the following strings on $A = \{a, b\}$ unless otherwise stated.

Problem A:

Find a regular expression of all strings of a's of odd length.

$((a^3))^*$

This regular expression guarantees a string of a's divisible by three.

Problem B:

All strings of length exactly 4.

$((a + b)(a + b)(a + b)(a + b))$

This regular expression guarantees a string 4 in length of any combination of a's and b's.

Problem C:

Find a regular expression of all strings a, b, c that begin with a or c and end with b.

$((a + c)(a + b + c)^*b)$

This regular expression guarantees a string that starts with a or c and contains any combination of a, b, or c in between. Ending with a b.

Problem D:

Find a regular expression of all strings with at least two b's.

$((a + b)^*b(a + b)^*b(a + b)^*)$

This regular expression can create any string with a or b that contains at least two b's.

Problem E:

Find a regular expression of all strings with at least one a and at least one b.

$((a + b)^*a(a + b)^*b(a + b)^*)$

This regular expression guarantees a string of any combination that contains at least one a or b.

Problem F:

Find a regular expression of all strings that contain at least one double letter.

$((a + b)^*(aa + bb)(a + b)^*)$

This regular expression guarantees a string of any combination that contains an aa or a bb.

Problem G:

Find a regular expression of all strings that do not contain a double letter.

$((ab)^*a(ba)^*)$

This regular expression guarantees a string of any combination that contains no double letters.

Problem H:

Find a regular expression of all strings that contain the pattern aba or bab or both.

$((aba)^* + (bab)^*)^+$

This regular expression guarantees a string of either aba's or bab's that contain at least one of the patterns.

Problem 1:

Find a regular expression of all strings with an even number of a's.

$(aa + b)^*$

This regular expression guarantees a string of a's or b's with the number of a's always divisible by two.

Problem 2:

For the next two problems, describe in english the strings that are defined by each of the following regular expressions.

Problem A:

$a^*ba^*ba^*$

This regular expression defines a string that starts with any number of a's (including zero) followed by one b. The string then contains any number of a's followed by another b. Finally, the string ends with any number of a's.

Problem B:

$(a + b)^*(aa + bb)$

This regular expression defines a string that starts with any combination of a's or b's in any length. The string then ends with either aa or bb.

Problem 3:

For the next four problems, indicate whether the listed strings match:

$b^+a^3(b + \lambda)a^2(a + b)^*$

Problem A:

baaabbaaab

This string fails the expression. This is because the two b's in the center of the expression cannot be made. This expression defines either nothing or one b after 3 a's. This does not take place.

Problem B:

baaabaaaab

The expression is capable of producing such a string.

Problem C:

baaaaabbbaa

This expression is capable of producing such a string.

Problem D:

aaabaa

This string fails the expression. According to the expression the string must begin with at least one b. This is clearly not the case.

Problem 4:

Circle the first letter in each string above that does not match the requirements of the regular expression.

Note: The letter that is in bold represents the circled letter.

baaab**b**aaaab

aaabaa

Problem 5:

What is the shortest possible string that WOULD NOT match the regular expression?

The shortest possible string is simply...

λ (nothing)

This is because the expression requires a string that begins with at least one b. So an empty string would fail.

Problem 6:

What is the shortest possible string that WOULD match the regular expression?

baaaaa

A b followed by five a's is the shortest string this expression would accept.

Conclusion

I found this assignment to be quick and easy. This was nice because of the three assignments due this week. In addition, the notion of an expression defining strings is new to me and something I find to be intriguing. Looking forwards to our last lecture!