Assignment No. 1

Q1 Describe the language denoted by the following regular expression:

1. $a(a|b)^*a$
2. $((\varepsilon|a)b^*)^*$
3. $(a|b)^*a(\varepsilon|b)(a|b)$
4. $a^*ba^*ba^*ba^*$
5. $!!(aa|bb)^*((ab|ba)(aa|bb)^*(ab|ba)(aa|bb)^*)^*$

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

The regural expression "$a(\varepsilon|b)^*a$" denotes the set of all strings that start with and end with the letter "a" and can have any number of 'a' or 'b' in between.

Example - aa
aba
aaba

2. $((\varepsilon|a)b^*)^*$

It denotes set of all strings that can be formed using letters a and b including empty string. "$(\varepsilon|a)$" matches with either empty string or letter a. "b^*" any number of occurance of b including zero.

3. $(a|b)^*a(a|b)(a|b)$

It denotes all strings that start with combination of a+b, and with aba or abb with any number of a & b in betⁿ.

example. a
baa
abb
babababa

4. ~~a*ba*ab*~~ a*ba*ba*ba*

It denotes the set of strings that have three b characters separated by any number of a characters.

bbb

ababab

5. !!(aa|bb)*((ab|ba)(aa|bb)*(ab|ba)(aa|bb)*)*

string of a's and b's that has even number of characters a's and b's

example - aabbaabb

bbaa

baba

bbbb.

Q2 Write regular definitions for the following languages:

1. All strings of lowercase letters that contains the five vowels in order.

Consonant → [bcdfghjklmnpqsrtvwxyz]

vowel → ~~consonant* a.* (consonant|a)*~~

consonant* a.* consonant* e.* consonant* i.* consonant* o.* consonant* u.*

2. All strings of lowercase letters in which letters are in ascending lexicographic order.

a*b*c*d*....z*

^[a-z]*$

3 Comments, consisting of a string surrounded by /* and */, without an intervening */, unless it is inside double quotes (")

\/*(?:(?!*\/|").)**\/

'\/*' - matches opening '/*'

'(?:(?!*\/|").)*' - matches any character, not immediately followed by closing '*/' or '"'.

'*\/' - matches closing '*/'.

4. !! All strings of digit with no repeated digits. Hint: Try this problem first with a few digits, such as {0, 1, 2}

A → 0?2(02)*

B → 0|A?0?1(A0?1|01)*A?0?|A0?

5. !! All strings with digits at most repeated digit.

^(?!.*(\d).*\1)\d+$

^ - start of string

(?!.*(\d).*\1) — .* matches any character 0 or more times

(\d) matches any digit & captures in group 1

\1 backreference to group 1. to match the same digit as before.

\d+ - matches one or more digits

$ - end of string

6. !! All strings of a's and b's with an even number of a's and an odd number of b's

(aa|bb|(ab|ba)(aa|bb)*(ba|ab))*(b|(ab|ba)(bb|aa)*a)

7. !! All strings of a's and b's that do not contain the substring abb.

b*(a+b)?

^(?!abb)[ab]*$

8 All strings of a's & b's that do not contain the subsequence abb.

b*(a+b)?

^(?!abb)[ab]]*$