COP4020.02   **Brandon Thompson**

Dr. Muhammed Abid   Due: 2/7/21

Assignment 2: Chapter 4

PROBLEM #1 (15 POINTS):

   Construct a regular expression defining each of the following languages over the alphabet $\Sigma = \{a, b\}$:

   a) The language of all words that do not begin with ba.

   b) The language of all words in which the total number of b's is divisible by 3 no matter how they are distributed, such as *bbabbaabab*.

   c) All words that contain exactly 2 b's or exactly 3 b's, not more.

   d) All words in which a appears tripled, if at all. This means that every clump of a's contains 3 or 6 or 9 or 12....a's.

   e) All words that contain at least one of the strings $S_1, S_2, S_3,$ or S_4.

SOLUTION:

   a)

PROBLEM #2 (15 POINTS):

Construct a regular expression defining each of the following languages over the alphabet $\Sigma = \{a, b\}$:

a) All strings that end in a double letter.

b) All strings that do not end in a double letter.

c) All strings that have exactly one double letter in them.

d) All words in which the letter b is never tripled. This means that no word contains the substring bbb.

e) All words in which a is tripled or b is tripled, but not both. This means each word contains the substring aaa or the substring bbb but not both.

SOLUTION:

a)

PROBLEM #3 (10 POINTS):

Let us consider the regular expression

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

Show that this is equivalent to

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

In the sense that they define the same language.

SOLUTION:

PROBLEM #4 (5 POINTS):

If the only difference between L and L^* is the word Λ, is the only difference between L^2 and L^* the word Λ? Show by example.

SOLUTION:

PROBLEM #5 (12 POINTS):

Describe in English phrases the languages associated with the following regular expressions.

a $(a + b)^*a(\Lambda + bbbb)$

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

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

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

SOLUTION: