Assignment 7

Due: Mon. Apr. 28, 2008.

Please see Exercises on Pages 640–642 and 664–666 of textbook. Also see, in particular, solutions to selected exercises at the end of textbook.

Question 1 (10%)
Find a language (i.e., a set of strings) to describe each of the following regular expressions:
\[ a + bc, \; ab^* + c, \; a^*bc^* + ac \]

Question 2 (10%)
Find a regular expression to describe each of the following languages
1. \( \{ aa, ab, ac \} \)
2. \( \{ a, b, ba, abb, baa, \ldots, ab^n, ba^n, \ldots \} \)
3. \( \{ \Lambda, a, b, c, aa, bb, cc, \ldots, a^n, b^n, c^n, \ldots \} \)

Question 3 (10%)
Find a regular expression for each of the following languages over \( \{ a, b \} \):
1. Strings whose length is a multiple of 3.
2. Strings with an odd number of \( a \)'s.

Question 4 (10%)
Simplify the following regular expression:
\[ aa(b^* + a) + a(ab^* + aa) \]

Question 5 (10%)
Prove the following equality
\[ a^*(b + ab^*) = b + aa^*b^* \]

Question 6 (10%)
Solve problem 1 on Page 664 of textbook.

Question 7 (20%)
Construct an NFA for each of the following regular expressions
1. \( (a + b)^*a \)
2. \( a^*b^* \)
3. \( a^*bc^* + ac \)
4. \( (a + ab^*c)^* \)

Question 8 (20%)
Solve problem 8 on Page 665 of textbook (all parts).

Question 9 (Extra Credit)
Solve problem 10 on Page 666 of textbook.