Regular Expression and Deterministic Finite Automata homework
Due Wednesday, October 3, 2012.

To be done individually, i.e., you may only discuss the problems with me.

Turn in a paper copy (8 ½ by 11 inch paper) of your solutions, numbered and in order.
Please only write on one side of the paper.

Note: λ is the empty string.

1. For the following regular expressions, give an example of two strings that can be generated by the regular expression and two that use the same alphabet, but cannot be generated.

   (a) (a | bc)* alphabet = {a, b, c}
   (b) ((λ|0)1)* alphabet = {0, 1}

2. Let the alphabet = {0, 1}.
   For the following, write a regular expression and draw a deterministic finite automata:

   (a) All strings that begin and end in a different digit. Note that λ is not in the language.
   e.g., 10 1010 011010011 000011
   (b) All strings that contain an even number of zeros.
   e.g., 01010101010111111111 0000 11 1001110101
   (c) All strings that contain only even clumps of zeros (together).
   e.g., 11100100001001 0000 1 00100 λ
   (d) All strings where a zero occupies the even positions (from the left).
   e.g., 101010101 00000000 001001001 1 10 0 λ

3. Write a regular expression to describe one kind of Pascal comment, the type surrounded by (* *).
   To help the reader, replace the * with a period; replace the parentheses with square brackets, [ ].
   For example,  [. ...hello.... .] is a comment instead of (* ***hello**** *).

   Additionally, for readability, use variables for groups of characters. For example, let
   A = {all characters except '.}' and so on.

   Be careful about what is included inside the comment. As soon as a "." is encountered, the comment is considered ended.

4. Describe the following languages denoted by the following regular expressions in English.
   For example, give brief descriptions (one sentence) similar to those of problem #2.

   (a) 0(0|1)*0
   (b) ((λ|0)1*) *
   (c) (0|1)*0(0|1)(0|1)

5. Let S = {a, bb, bab, abaab}.
   S* are all the strings that can be constructed using any combination of the strings in S.
   (a) Is abbabaabab in S*? (yes or no)
   (b) Is abaabbabaabb in S*? (yes or no)
   (c) Does any word in S* have an odd total number of b’s? (yes or no)

   Briefly explain (one sentence).