Assignment #2

Date Due: February 26, 2018

Total: 100 marks

---

1. (20 marks) Give a regular expression for the following language over the alphabet $\{0, 1\}$:
   (a) the set of all strings beginning with 010 and ending in 10110.
   (b) the set of all strings beginning with 1010 and ending in 0101.
2. (40 marks) Give a regular expression for each of the following languages over the alphabet $\{0, 1\}$:
   (a) the set of all strings consisting of alternating groups of 11 and 10 (11 and 10 *alternates*);
   (b) the set of all strings whose fifth symbol from the right end is a 1;
   (c) the set of strings that either begin, or end (or both) with 1110;
   (d) the set of strings such that the number of 0's is divisible by five, and the number of 1's is divisible by six.

   Transform the regular expressions obtained for 2c into an equivalent ε-NFA, and afterwards in a DFA, using the algorithms learned in class (or the ones in your textbook)(10 marks).

   Minimize the resulting DFAs(10 marks).
3. (20 marks) Write regular expressions for the following languages over the alphabet $\Sigma = \{0, 1, 2, 3, 7\}$:
   (a) the set of all strings beginning with a 1, 2 or 3, that, when the string is interpreted as an integer in base 9, is a multiple of 6 plus 4. For example:
      - strings 11, 31,37 ,1111, 3001, 301, 3331, 22211, and 22277 are in the language;
      - the strings 10, 00,011, 0010, 36 , 13, 23, 113, 1313, 2347,2, 21, 161, 3333, 707, and 041 are not.

   (b) The set of all strings that ends with an 1, 2, or 3 and when the string is interpreted ***in reverse*** as an integer in base 9, is a multiple of 6 plus 4.
      Examples of strings in the language are 11, 13,73 ,1111, 1003, 103, 1333, 11222 and 77222
      Examples of strings that are not in the language are: 0, 00, 01, 110, 0100,63, 31, 32, 161,311, 3131,7432, 2, 12, 3333, 707, and 140 .
4. (maximum 12 marks) Check your results with Grail+ and comment on the Grail+ experiments.