# Finite Automata Theory and Formal Languages
# TMV027/DIT321 – LP4 2018

## DFA and NFA

## Assignment 2 – Deadline: Sunday 15th of April 23:59

**Assignments should be done and submitted individually!**

For obtaining full points the answers should contain enough explanation/description so that they are easy to understand.

1. (1pt) Describe with words the language accepted by the following DFA:

| | 0 | 1 | 2 |
|---|---|---|---|
| $\rightarrow q_0$ | $q_1$ | $q_0$ | $q_2$ |
| $q_1$ | $q_2$ | $q_1$ | $q_1$ |
| $^*q_2$ | $q_2$ | $q_2$ | $q_2$ |

   Note: You are not asked to describe the $\delta$ function with words nor to explain when a word is accepted. You are asked to describe as best as you can which are the words in the language (for example "words starting with 0, ending with 1 and having an even number of 2's").

2. (1.5pts) Define a DFA that accepts the language over the alphabet $\{0, 1\}$ where words start and end with a 1, have even length and where any 0 in the word is immediately followed by at least a 1.

   Example of accepted words: 1011, 101101, 1111

   Example of non accepted words: 101, 1001, 010

3. Consider the alphabet $\Sigma = \{a, b\}$.
   (a) (1pt) Define a DFA accepting the words over $\Sigma$ which do not contain $bba$ as substring.
   (b) (0.5pts) Define a DFA accepting the words over $\Sigma$ with an even number of $a$'s.
   (c) (1.5pts) Use the product construction to give a DFA accepting the words over $\Sigma$ which satisfy both of the above criteria.

4. (a) (2.5pts) Give an NFA that accepts the language over the alphabet $\{a, b\}$ where words contain $baa$ as substring or where any $a$ is immediately followed by at least two $b$'s.
   (b) (2pts) Use the subset construction to build the corresponding DFA.