

# Computing Theory – Homework #1

**Due:** March 29, 2016 13:00

Take care of the readability of your solutions, from which you may lose 10 points.

- 1) **[20 Points]** For  $n \in \mathbb{N}$ , prove the following equalities by using induction method.

$$1^6 + 2^6 + 3^6 + \dots + n^6 = \frac{n}{42}(n+1)(2n+1)(3n^4 + 6n^3 - 3n + 1)$$

- 2) **[30 Points]** Page 84, Exercise 1.6

- 3) **[30 Points]** Page 84, Exercise 1.7

- 4) **[20 Points]** Show by giving an example that,

- a) If  $M$  is a DFA that recognizes language  $C$ , swapping the final and non-final states in  $M$  yields a new DFA that recognizes  $\bar{C}$ .
- b) If  $M$  is an NFA that recognizes language  $C$ , swapping the accept and non-accept states in  $M$  doesn't necessarily yield a new NFA that recognizes  $\bar{C}$ .

Best luck!

**The course book:** *Introduction to the theory of computation, 2nd Ed., Massachusetts Institute of Technology, by Micheal Sipser.*