Theory of Computing

CSE-203

Assignment 1

Due date: 16/05/ 2017 Total points: 15

Problem 1: (1 points)

Consider the following sets of integer numbers:

$S_1 = \{4, 5, 6\}$

$S_2 = \{i: i \text{ is even}\}$

$S_3 = \{i: i \text{ is divisible by } 3\}$

For each set below determine its elements.

$S_4 = S_1 \times S_2$

$S_6 = S_1 \cap S_2$

$S_7 = S_2 \cap S_3$

Problem 2 (3 points)

Prove the following equality by induction

$$1^3 + 2^3 + 3^3 + \ldots\ldots\ldots\ldots + n^3 = (1 + 2 + 3 + \ldots\ldots\ldots\ldots + n)^2$$

Problem 3 (7 points)

For each of the following three languages on $\sum = \{a, b\}$, draw a deterministic finite automaton that accepts it:

a. All strings that have no ***b***'s
b. All strings with at least two ***a***'s and any number of ***b***'s
c. All strings with at most two ***a***'s and any number of ***b***'s
d. All strings that have neither ***aa*** nor ***bb*** as a substring
e. All strings that have an odd number of ***a***'s and an even number of ***b***'s
f. All strings that have both ***ab*** and ***ba*** as substrings
g. All strings that have ***a*** which is immediately preceded and immediately followed by a ***b***

Problem 4: (4 points)

For the alphabet $\sum = \{a, b\}$, draw a deterministic finite accepter that is equivalent to the following nondeterministic accepter: