

# Assignment 6 (Recursive Algorithms )

## Question 1

Implement in C++ and Java three sorting algorithms, including the merge-sort and quick-sort algorithms, and compare the implementations on CPU time using three different inputs.

## Question 2

Write a function that counts the number of  $n$ -letter words of the alphabet  $\Sigma = \{a, b\}$  that do not contain the string  $aa$ ; use dynamic programming to speed-up the function.

## Question 3

Write a function that returns a list of all of the  $n$ -element subsets of a given set. For example, if the given set is  $[1, 2, 3]$  and  $n$  is 2, then the returned list should contain  $[1, 2]$ ,  $[1, 3]$ , and  $[2, 3]$ . The order of the elements is not important.

## Question 4 (Sudoku)

Given an  $9 \times 9$  board with some squares already filled with hint values, the objective of the Sudoku problem is to fill all the empty squares with values in  $1..9$ , such that each row, each column, and each of the 9 blocks are filled with distinct values. Write a program in C++ or Java that solves the following Sudoku instance:

```
A={{5,3,_,_,7,_,_,_,_},
   {6,_,_,1,9,5,_,_,_},
   {_,9,8,_,_,_,_,6,_},
   {8,_,_,_,6,_,_,_,3},
   {4,_,_,8,_,3,_,_,1},
   {7,_,_,_,2,_,_,_,6},
   {_,_,_,_,_,_,_,_,_},
   {_,_,_,_,_,_,_,_,_},
   {_,_,_,_,_,_,_,_,_}}.
```