

# Homeworks

for E2011

## 1 Problem 1

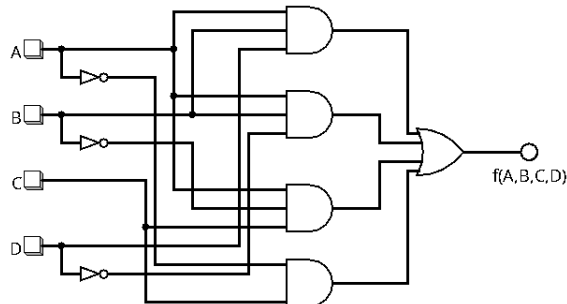
Prove de Morgan's laws,

$$\overline{X + Y} = \overline{X} \overline{Y}$$
$$\overline{XY} = \overline{X} + \overline{Y}$$

using truth tables and set theory.

## 2 Problem 2

Given the logic circuit below, find the implemented function, simplify it and reimplement the simplified form.



## 3 Problem 3

Let  $[a_i], i = 1, \dots, N, N \geq 3$  be a real-valued vector. Write the pseudocode to

- let the user input the values for  $[a_i]$
- compute a new vector  $[s_i]$  defined as

$$s_i = \begin{cases} 0 & i \in \{1, N\} \\ \frac{a_{i+1} - a_{i-1}}{2} & 0 < i < N \end{cases},$$

- display (output) the result

## 4 Problem 4

Consider a polynomial of degree  $n$  specified by its coefficients  $a_0, a_1, \dots, a_n$ ,  $P(X) = a_n X^n + a_{n-1} X^{n-1} + \dots + a_1 X + a_0$ . Write the pseudocode for computing  $P(x)$  for any given  $x \in \mathbb{R}$  and for computing  $P'(x)$  where  $P'$  is the first derivative of  $P$ .