

TD Series N°. 4 Combinatorial and Sequential Logic

Exercise 1

Construct a combinational logic system that realize the addition (or subtraction) of two bits a , b and the carry value C (or borrow value B). A control signal M determines the type of operation to be performed:

$$\left\{ \begin{array}{l} M=0: \text{the system adds.} \\ M=1: \text{the system subtracts.} \end{array} \right.$$

The system's outputs are:

$S(D)$: the sum (or difference) and $C^+ (B^+)$: the new carry value (or the new borrow value).

Exercise 2

Realize the following logic functions **using only 2→1 Multiplexers**

a- $F = a + b$

b- $G = a \cdot \bar{c} + \bar{a} \cdot b$

Exercise 3

Simplify the following logical function by Karnaugh table:

$$F_{abcd} = \sum (0, 1, 4, 8, 9, 10) + \emptyset (2, 5, 7)$$

Exercise 4

Consider a (SPA) company that has four actuators (A , B , C , and D), each actuator having a number of actions:

A : 60 actions

B : 100 actions

C : 160 actions

D : 180 actions

We want to create an automatic voting system to validate company projects.

Pressing the actuator button means 1 (logical state 1). The system output is 1 if the number of actions of the actuators voting 1 (yes) is greater than or equal to half plus one of the total actions of the company.

Draw the diagram of the installation.