University of Guelma

Computer Science Department **1st-year Computer Science Engineer**

Module: Machine Structure **Academic year: 2024/2025**

Serie of Tutorial Works N° 2

Ex 01 :

a. Demonstrate that the NOR operator is not associative. (Use the symbol ↓ to represent the NOR operator).

b. Consider the function: F(x, y, z) = $\bar{x}yz + x$, express this function using the NOR operators only.

Ex 02 :

Establish the truth tables for the following functions, then write them in the two canonical forms:

1. $F_1 = XY + YZ + \bar{X}Z$
2. $F_2 = X + YZ + \bar{Y}\bar{Z}T$

Ex 03 :

Demonstrate the following relationships:

1. $AB + ACD + \bar{B}D = AB + \bar{B}D$
2. $(\bar{A} + B)(A + C)(B + C) = (\bar{A} + B)(A + C)$
3. $AB + \bar{B}C = (A + \bar{B})(B + C)$
4. $\overline{A\bar{B} + \bar{A}B} = AB + \bar{A}\bar{B}$
5. $\overline{(A + B)(\bar{A} + C)} = (A + \bar{B})(\bar{A} + \bar{C})$

Ex 04 :

Give the logic diagrams of the following functions, using:

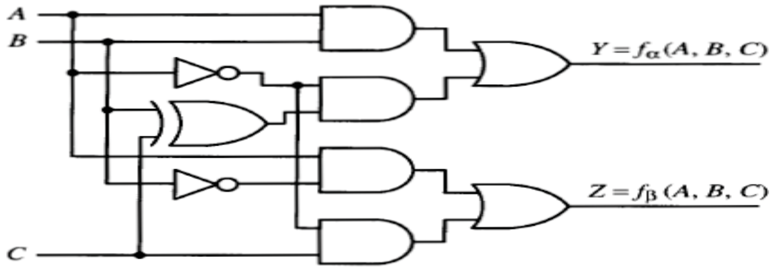
1. AND and OR gates and inverters,
2. NAND gates and inverters,
3. NOR gates and inverters.

- $F_1 = (A + B).C\bar{D}$
- $F_2 = A(\bar{B} + C) + B\bar{C}$

NB : We don't ask to simplify the functions beforehand.

Ex 05 :

I. Consider the following logic diagram:



1. Determine the logic expressions corresponding to the two outputs Y and Z of this logic diagram.
2. Establish the truth table corresponding to the two outputs Y and Z of this logic diagram.
3. Determine the 1st canonical form of the two outputs Y and Z of this scheme.

II. Demonstrate the following equalities using the rules of Boolean algebra. Start from the first part of the equality to reach the second part.

- $A+B\overline{C}+\overline{A}\,(\overline{B}+C)(AD+B) = A+B$
- $\overline{(A+B)\,(\overline{A}+C)} = (A+\overline{B})\,(\overline{A}+\overline{C})$