German-Jordanian University
School of Electrical Engineering and Information Technology
Department of Computer Engineering

CE2120-Digital Systems Lab
Lab 4

I. Objectives

The objective of this lab is to introduce students to Boolean algebra reduction techniques and how to build multilevel logic circuits using universal gates.

II. Preparations

1. Simplify the following functions using Boolean algebra theorems:
   a. F(A,B,,C) = A'.B.C + B'.C +A.C'
   b. G(X,Y,Z) = (X+Y') . (X'+Y').(Y+Z')

2. Obtain logic diagrams of the following functions using only 2-input NAND gates:
   a. F(X,Y,Z) = (X.Y.Z) + (Y.Z')+(X.Z')
   b. G(A,B,C) = (A +C') · (B'+C)

   For each of the above functions, construct the truth table.

3. Obtain logic diagrams of the following functions using only 2-input NOR gates:
   a. F(A,B,C) = (A'+C) · (A +B)
   b. G(X,Y,Z) = X.Z +Y· Z'

   For each of the above functions, construct the truth table.

4. Obtain logic diagram for a 3-input OR gate using only 2-input NAND gates (Hint: use the Boolean algebra theorems to build the logic circuit).

5. Obtain logic diagram for a 3-input AND gate using only 2-input NOR gates (Hint: use the Boolean algebra theorems to build the logic circuit).

III. Laboratory work

In this experiment:

a. Build the circuit in 2.a on the breadborad.
b. Build the circuits in 3.b on the breadborad.
c. Build the circuit in part 4 on the breadborad.
d. Build the circuit in part 5 on the breadborad.