UNIVERSIDADE FEDERAL DE MINAS GERAIS
INSTITUTO DE CIÊNCIAS EXATAS
DEPARTAMENTO DE CIÊNCIA DA COMPUTAÇÃO

Disciplina: Introdução aos Sistemas Lógicos
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Lista de Exercícios 1

Exercícios Teóricos

1. Which of the following contain circuits that are likely to be combinational and which contain sequential circuits? Explain your rationale.
(a) A washing machine that sequences through the soak, wash, and spin cycles for preset periods of time.
(b) A three-input majority circuit that outputs a logic 1 if any two of its inputs are 1.
(c) A circuit that divides two 2-bit numbers to yield a quotient and a remainder.
(d) A machine that takes a dollar bill and gives three quarters, two dimes, and a nickel in change, one at a time through a single coin change slot.
(e) A digital alarm clock that generates an alarm when a preset time has been reached.

2. Draw the schematics for the following function using NOR gates and inverters only:
[(X + Y) + (X + Z)]

3. Draw the schematics for the following function using NAND gates and inverters only: XY + XZ

4. Use switching diagrams to demonstrate the validity of the following simplification theorem: X + XY = X

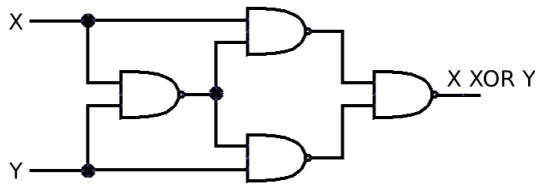
5. Prove the following simplification theorem using the first eight laws of Boolean algebra: (X + Y)(X + Z) = XZ + XY

6. Verify that: NOR and NAND are duals of each other.

7. Use DeMorgan's theorem to compute the complement of the following Boolean expression: X(Y + ZW + V S)

8. Form the complement of the following function: f(A,B,C,D) = ABC + (A + B + D)(ABD + B)

9. Using Boolean algebra, verify that the schematic of the figure above implements an XOR function.



10. Simplify the following function using the theorems of Boolean algebra. Write the particular law or theorem you are using in each step. For each simplified function you derive, how many literals does it have? f(X,Y,Z) = (X + Y)(X + Y + Z)(X + Y + Z)

11. Consider the function f(A,B,C,D) = (AD + AC)[B(C + BD)].
(a) Draw its schematic using AND, OR, and inverter gates.
(b) Using Boolean algebra,put the function into its minimized form and draw the resulting schematic.

Exercícios de Simulação

1. Implemente um circuito meio somador (half-adder) com CIs utilizando um software que simule a breadboard, como o Winbreadboard ou Java Breadboard. Mostre a forma de onda.