CSCI 162 Assignment 2

Due Feb 18, 2012

Part 1: [20]

Answer these questions in a .doc or .txt file and submit via D2L. The name of the file must be in the format JB123456789.txt (or .doc) where JB is your initials and 123456789 is your student number.

I. [2] Construct a truth table for the following: *(x + y)(x + !y)(x + z).*

2. [2] Show that *(!x + y) (x + z)(x + !z)= xy*, using Boolean identities.

3. [2] Simplify the following function expression using Boolean algebra end its identities. Reference the identity used at each step.

$$\overline{\overline{\overline{x}\overline{x}}\,\overline{y}}$$

4. [4] Draw the Karnaugh map and the resulting simplified circuit for the following function.

$$F(w, x, y, z) = \overline{y}z + w\overline{y} + \overline{w}xy + \overline{w}\overline{x}y\overline{z} + w\overline{x}yz$$

Definition: For positive-valued functions f and g, f(n) ∈ **O**(g(n)) iff there exist constants c >0 and $n_0 \geq 1$ such that
$f(n) \leq c \cdot g(n)$ for all $n \geq n_0$.
Furthermore, if f(n) ∈ **O**(g(n)) and g(n) ∈ **O**(f(n)) then f(n) ∈ **Θ**(g(n)) and vice versa.

Use the definition of Big-Oh (i.e., find a value for c and n_0, or prove such do not exist) to show the following:

1. [2] $3n^3 + n^2 - 8 \in \mathbf{O}(n^4)$
2. [2] $n^4 \notin \mathbf{O}(n^3)$.
3. [2] Is $3n^3 + n^2 - 8 \in \mathbf{\Theta}(n^4)$? Justify your answer.
4. [2] Prove using the definition of Big Oh the following claim:
   if f(n) ∈ **O**(g(n)) then 1/g(n) ∈ **O**(1/f(n)).

5. [2] Use the Rules of Big Oh and Big Omega to prove the following: $4n^{1.1} + 6\ n \log n$ is in $\mathbf{O}(n^{1.1})$.

Part 2 [15]

In mathematics, the Fibonacci numbers are the numbers in the following integer sequence:

1 2 3 5 8 13 21

The first two numbers in the Fibonacci sequence are 1 and 2, and each subsequent number is the sum of the previous two.

Create an Assembly program in MARIE that inputs a number (count) from the user and then outputs the first "count" Fibonacci numbers to the output window. Save the code in a .mas file and submit via Moodle. The name of the file must be in the format JB123456789.mas where JB is your initials and 123456789 is your student number.

A suggested algorithm is this:

Variables:
N //The most recent number calculated.
N1 = 1 // The number calculated before the current number.
N2 = 0 // The number calculated before N1.
Count // The number of Fibonacci numbers to generate.

Algorithm:

Get the number for Count from the user.
Repeat
    N = N1 + N2.
    Ouput the result.
    N2 = N1
    N1 = N
    Count = Count -1
Until Count == 0