Quizzes for General CS II (320201) Spring 2014

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Contents

Quiz 1: Graphs and Trees
(Given Feb. 9. 2014)

Problem 1.1 (Graph and Trees)

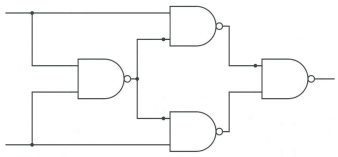
12pt

1. Draw the parse tree of the following expresion: $(\overline{x_1} + x_3) * (x_1 + x_2)$.
2. Give an example of a different graph that is isomorphic to this parse tree and write its mathematical representation.
3. Can this parse tree be isomorphic to a graph with a cycle? Why or why not?

Quiz 2: Combinatorial Circuits
(Given Feb. 17. 2014)

Problem 2.1 (Combinatorial Circuits)

Design a full adder consisting of NAND gates ONLY, based on the definition from the slides. Note that giving the circuit for a full adder that consists of OR, AND and XOR gates will only bring half the points. The XOR gate represented with NAND gates is provided below. 12pt



Quiz 3: Twos Complement Numbers (Given Feb. 24. 2014)

Problem 3.1: Given following integer numbers in base ten. Convert them to 32-bit 12pt Two's Complement numbers.

1. 3643
2. 5731923
3. -128
4. -24689

Quiz 4: Simple While and L(VM)
(Given Mar. 10. 2014)

Problem 4.1 (A sum in $\mathcal{L}(\texttt{VM})$)
Compute the following sum in $\mathcal{L}(\texttt{VM})$ using an **iterative** approach (i.e. you may not compute the result using a formula): 12pt

$$\sum_{i=1}^{N} i \cdot (i-1)$$

You have $\mathcal{S}(0) = N$ and you should "output" the result of the sum in $\mathcal{S}(1)$. For example, for $N = 3$, your program should halt with $\mathcal{S}(1) = 8$.

Also, simulate the execution of your program (including the stack evolution), for $N = 3$.

Note: It is always a good idea to comment your code!

Quiz 5: Static procedures
(Given March. 17. 2014)

Problem 5.1 (Towers of Hanoi)

The Towers of Hanoi is a very famous mathematical puzzle. Given three pegs, one with a set of N disks of increasing size, determine the minimum (optimal) number of steps it takes to move all the disks from their initial position to another peg without placing a larger disk on top of a smaller one. 12pt

Write down a static procedure in $\mathcal{L}(\texttt{VMP})$ that computes the solution to the puzzle, given N.

Quiz 6: Turing Machines
(Given Mar. 24. 2014)

Problem 6.1 (TM compare two numbers)

Given the alphabet $\{0, 1, \#\}$, where # symbolizes an empty cell, consider a tape with the input 0^n1^m, where n and m are natural numbers, (followed by infinitely many #s). Design a TM that halts in a state "yes" if $n > m$ and in state "no" otherwise. 12pt