Quizzes for General CS II (320102) Spring 2015

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For Course Purposes Only

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Contents

Quiz 1 (Graphs and Trees) Given Feb. 9. 2015

Problem 1.1 (Parse Tree)
Draw the parse tree of the expression $\overline{x_1} + x_2 * \overline{x_3}$ and provide a mathematical representation of it. 4pt

Problem 1.2 (BBT of Depth 8)
Let $\mathcal{T}$ be a balanced binary tree with depth 8, how many nodes and leaves does $\mathcal{T}$ have minimally and maximally (we expect 4 numbers), justify your answer. 8pt

Quiz 2 (Adders) Given Feb. 16. 2015

Problem 2.1 (CSA and CCA Theory)
Draw the basic building blocks for the following circuit elements: 12pt

1. n-bit Carry Chain Adder
2. n-bit Conditional Sum Adder

For both of the circuit elements given above, state their

- cost and
- depth

in Landau notation.

Quiz 3 (Circuits and TCN) Given Feb. 23. 2015

Problem 3.1 (Binary Arithmetics)
Let $A = 367$, $B = 38$. 6pt

1. Convert A and B into an n-bit TCN system. What is the minimal n to encode both A and B?

2. Perform binary operations $A + B$ and $A - B$. Check the result by converting back to the decimal system.

Problem 3.2 ("2-bit Address Decoder")

6pt

Draw the circuit for a 2-bit address decoder using AND, NOT and/or OR gates.

Quiz 4 (ASM Language) Given Mar. 2. 2015

Problem 4.1 (Swapping numbers)
Given $x > 2$ in $D(0)$ and $y > 2$ in $D(1)$, write an ASM program that swaps the values of $D(x)$ and $D(y)$. You are allowed to use either version of the language, as long as you are consistent. 12pt

Quiz 5 (LVMP and MicroML) Given Mar. 9. 2015

Problem 5.1 Translate the following μML code to $\mathcal{L}$(VMP). 12pt

```
let
        fun f(a) = g(a, a+1, a+2);
        fun g(a, b, c) = if a+b<c then a*c-b else (a+c)*b;
        val y=10;
in
        f(y)
end;
```

Quiz 6 (LVMP and MicroML) Given Mar. 16. 2015

Problem 6.1 12pt

Given an alphabet $\{0, 1, \#\}$ write the transition table for a Turing Machine that checks whether the input, written in binary, is a power of two. The input will be surrounded by #s. You can assume the head is at the first non-# character. The machine should halt in the 'yes' state if the input is a power of two and in the 'no' state otherwise.

Quiz 7 (Internet and the WWW) Given Apr. 13. 2015

Problem 7.1 (Uniform Resource Identifiers)
What is an URI? Explain what is the syntax of an URI. You can use the following example to help you in your explanation: 6pt

```
http://thelast.net:80/problem?course=gencs2#solution
```

Problem 7.2 (Internet Protocol Suite)
What is the *Internet Protocol Suite*? Define its structure as detailed as possible. 6pt