YOUR NAME: _______________________________ YOUR TA’s NAME: ____________

LAST FOUR DIGITS OF YOUR UF-ID: ___ ___ ___ ___ Please Print Clearly (Block Letters)

Date Assigned: 28 August 2013 IN CLASS
Date Due: 11 September 2013 AT BEGINNING OF CLASS

This homework assignment must be completed by you alone. You may not copy from others. However, you may study with others or use external references to determine general solutions. Then you must complete the problems as your own work, not copying others’ work.

Questions about this homework should be addressed to your TA first. You can find your TA’s email at the class website: http://www.cise.ufl.edu/~mssz/CompOrg/TA-hours.html

This homework has three parts: (I) Regular Questions, (II) Problems to Solve, (III) Extra Credit. Complete all the work you can – there is no penalty for guessing.

Part I. Regular Questions [20 points total]

1. Vocabulary: (terms you need to know to discuss the subject intelligently) – Define the following terms using 1-3 sentences (and a diagram, if needed): [3 points each]
   a. Von Neumann bottleneck
   b. Truth table
   c. De Morgan’s Laws (for Boolean logic)
   d. Moore’s Law
   e. List the five parts of a computer

2. Concept Discussion: Von Neumann Architecture – (a) what is it (draw a picture) and (b) why is it important and/or useful in computing? [2 pts for a), 3 pts for b)]

Part II. Problems to Solve (DO NOT MINIMIZE CIRCUITS) [20 points total]

3. Logic Equation, Truth Table, and Circuit: (a) Draw the truth table of the following logic equation that has input variables x, y, and z:
   \[ f(x,y,z) = (x \text{ OR } y) \text{ AND } (\neg y \text{ OR } z) \]
   Then (b) draw the SOP logic circuit representation using NOT, AND, OR gate representations as in the viewgraphs for Lectures #2 & #3. [3 pts for a), 3 pts for b)]
Part II. Problems to Solve (continued)

4. Logic Equation, Truth Table, and Transformation: (a) Draw a truth table of the following logic equation that has Boolean input variables $x$, $y$, and $z$:

$$g(x,y,z) = (x \text{ NAND } (y \text{ OR } z)) \text{ AND NOT}(z),$$

then (b) draw the logic circuit representation using only NOR gate representations like we used in the viewgraphs. [3 pts for a), 3 pts for b]]

**Hint:** For part b), you should transform the above equation for the logic function $g$ using the table of transformations for Boolean logic presented in the Lecture #2 viewgraphs. Do not use minimization to produce or simplify the NOR-gate circuit.

5. Logic Equation and Circuit from Truth Table: Given the following truth table entries for a logical function $h(x,y,z)$ of input variables $x$, $y$, and $z$:

$$h(0,0,1) = 1; \quad h(0,1,0) = 0; \quad h(1,1,0) = 1$$

(a) use the truth table to write out only the sum-of-products (SOP) minterms and SOP equation for which the function $h$ gives a result of 1 (logical true). Then, (b) transform the SOP equation to POS (product-of-sums) form; and (c) draw the POS logic circuit using only NOT, AND, OR gates. [2 pts for a), 3 pts for b), 3 pts for c]]

Part III. Extra Credit [15 points total]

6. Performance Measurement: (a) What does benchmarking and performance measurement tell us about a computer? (b) What does SPEC mean, and why do we use benchmarks from www.spec.org to measure system performance? (c) Why do we combine benchmark results with the geometric mean operator? Justify each answer to get full credit. [5 points for each part a), b), and c]]