C262 Digital Systems
Fall 2012
Study Guide (Exam 1)

In order to do well on the first exam, you should be able to do the following:

Number Systems

1. Indicate the range of an N-bit unsigned number.
2. Indicate the range of an N-bit signed number (in 2's complement representation).
3. Convert an unsigned binary number to a decimal number, and vice versa.
4. Convert an unsigned binary number to a hexadecimal number, and vice versa.
5. Convert a hexadecimal number to a decimal number, and vice versa.
6. Convert a signed (2's complementary) binary number to a decimal number, and vice versa.
7. Add or Subtract two unsigned/signed numbers
8. Identify the MSb and LSb of a binary number.

Boolean Algebra

9. Develop truth tables for AND, OR, NOT, XOR, XNOR and NAND, NOR gates,
10. Develop a Boolean expression from a logic circuit.
11. Develop a truth table from a Boolean expression
12. Draw a logic circuit from a Boolean expression using AND, OR and NOT gates
13. Identify literals, product terms, minterms, sum of product (SOP), canonical sums, sum terms, maxterms, product of sum (POS), canonical products.
14. Determine if two Boolean expressions are logically equivalent using a truth table.
15. Find a sum of minterms or a product of maxterms from a truth table.
16. Simplify a Boolean expression to a minimum SOP form using Boolean/switching algebra. A table of properties of Boolean/switching algebra will be given.
17. Find a minimum SOP or POS expression from a truth table.
18. Write a SOP expression in shorthand notation (numeric form).

K-Maps

19. Plot a 3-var or 4-var K-map from a truth table, a SOP expression, or a SOP expression in shorthand notation.
20. Develop a minimum SOP expression from a 3-var or 4-var K-map (with or without Don't Care conditions).
21. Develop a minimum POS expression from a 3-var or 4-var K-map (with or without Don't Care conditions).
22. Identify all the implicants, prime implicants, and essential prime implicants from a 3-var K-map or a 4-var K-map.

Combinational Systems

23. Design and implement (using logic gates) a simple system to solve a problem (word). You are expected to determine the number of inputs and outputs of the system, develop a truth table, find the minimum expression(s) for each output, and draw a logic circuit to implement the minimum expression(s).
24. Calculate worst case propagation delay for a combinational logic circuit.
25. Draw a block diagram for iterative systems which include an n-bit adder, an n-bit add/subtract unit, and an n-bit comparator.
26. Describe the functionality of the 2-to-4 decoder (truth table or words). Draw a circuit for 2-to-4 decoder.
27. Describe the functionality of the 3-to-8 decoder (truth table or words).
28. Create a 3-to-8 decoder using 2-to-4 decoders only.
29. Implement a SOP expression using 3-to-8 or 2-to-4 decoders and OR gates only.
30. Implement a SOP expression using multiplexers.
31. Design and draw a block diagram for a circuit to perform simple arithmetic operations (add, subtract, etc).