

# Introduction to Digital Design ECE 215

## Summer 2005 Test 1

1. What number systems could each of the following numbers belong to? Select b (binary) o (octal) d (decimal) h (hexadecimal) (4 points)
  - (a) 10111
  - (b) 82105
  - (c) FE217
  - (d) 6745
2. What is the largest unsigned binary number that can be expressed with 10 bits? What is the equivalent decimal and hexadecimal? (3 points)
3. Convert the following numbers with the indicated bases to decimal. (6 points)
  - (a)  $(2431)_5$
  - (b)  $(121)_3$
  - (c)  $(987)_{12}$
4. Find the two's complement of  $110100_2$ . (1 point)
5. Convert the decimal number 8.3 to binary (4 points)
6. How many bits are required to encode 27 items? (1 point)
7. The fundamental gates are NOT, AND, OR, XOR. Draw and label the corresponding logic symbols and Verilog operators? (6 points)
8. Show the Venn diagrams for the above gates. (4 points)

9. Identify the following laws of Boolean algebra (in two forms) (3 points each)

(a) Commutative

(b) Associative

(c) Distributive

(d) DeMorgan's

10. Simplify the following Boolean expressions using Kmaps (4 points each)

(a)  $x'y' + yz + x'yz'$

(b)  $B'D + A'BC' + AB'C + ABC'$

11. Convert the above functions to canonical form. (4 points)

12. Find the truth table for the function  $F(x, y, z) = \sum(1, 5, 7)$ . (3 points)

13. What common computer operation or principle is expressed by a 2:1 multiplexer? (4 points)

14. Convert the expression  $x' + x(x + y')(y' + z')$  into sum of products and product of sums. (4 points)

15. Define or explain the following terms (3 points each)

(a) glitch

(b) finite state machine

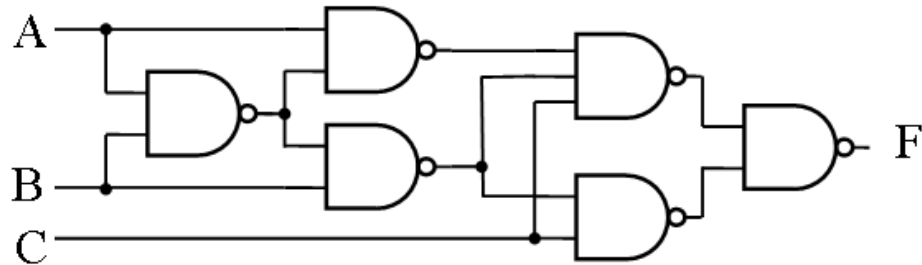
(c) negative logic

(d) multiplexer

(e) decoder

16. Explain the difference between *structural* Verilog and *dataflow* Verilog. (5 points)

17. Write a Verilog module for the following logic operation. (10 points)



18. Draw the symbol for a 2-to-1 multiplexer. (2 points)

19. Write a Verilog module for a 2-to-1 multiplexer, using the conditional-if operator. (4 points)