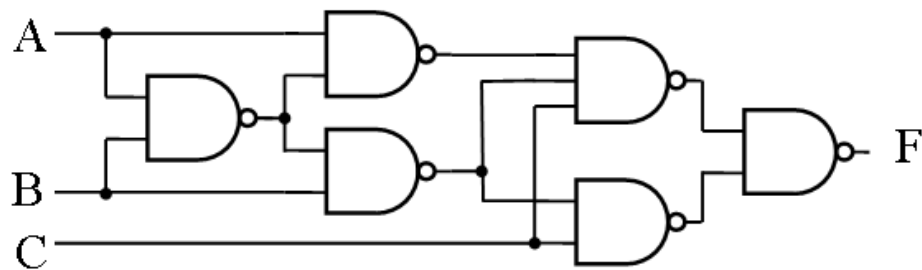


# Introduction to Digital Design ECE 215

## Summer 2004 Test 1

1. The fundamental gates are NOT, AND, OR, XOR. Draw and label the corresponding logic symbols and Verilog operators? (8 points)
2. Identify the following laws of Boolean algebra (in two forms) (3 points each)
  - (a) Commutative
  - (b) Associative
  - (c) Distributive
  - (d) DeMorgan's
3. Simplify the function  $F = xy + xy' + y'z$  (4 points)
4. Draw a Venn diagram for the above function. (4 points)
5. Convert the above function to canonical form. (4 points)
6. Find the truth table for the function  $F(x, y, z) = \sum(1, 3, 7)$ . (4 points)
7. What common computer operation or principle is expressed by a 2:1 multiplexer? (4 points)

8. Convert the expression  $x' + x(x + y')(y' + z')$  into sum of products and product of sums. (6 points)
9. Define or explain the following terms (3 points each)
- (a) glitch
  - (b) combinational circuit
  - (c) negative logic
  - (d) multiplexer
  - (e) decoder
10. What operation results from taking the XOR of a bit vector? (e.g.  $b_4 \oplus b_3 \oplus b_2 \oplus b_1 \oplus b_0$ ) (4 points)
11. Explain the difference between *structural* Verilog and *dataflow* Verilog. (5 points)
12. Write a Verilog module for the following logic operation. (10 points)



13. Draw the symbol for a 2-to-1 multiplexer. (2 points)
  
14. Design a 4-to-1 multiplexer using 2-to-1 multiplexers. (4 points)
  
15. Write a Verilog module for a 2-to-1 multiplexer, using the conditional-if operator. (4 points)
  
16. Write the Boolean equations corresponding to the following concurrent operations. Express the equations in Verilog notation (10 points)

