CDA 3103 Midterm Practice (Summer 2024)

Exam Format

- Exam duration and location: 2 hours in CHE 217
- Closed Everything: closed text, closed notes, closed electronics except calculators
- Bring:
  - Calculator (phone, wearables, and other mobile devices cannot be used as a calculator)
  - Pen + eraser
  - Pencil
  - USF ID
- Test Format
  - Paper exam administered in person
  - Multiple Choice
  - Open-Ended Questions
- Proctors may ask you to switch seats before and/or during the exam.

Academic Integrity

If the proctors of the exam notice any academic dishonesty during and/or after the exam is proctored, that student may receive a 0 on the exam, which may result in failing the course. There is also the possibility for the student to receive an FF and be reported to the department.

Topics

This is a quick overview of the topics. Make sure to go over the class slides. Do not rely on this document.

1. Computer Organization vs Computer Architecture
2. Computer Systems
   a. Processor, Memory, and Mechanism
3. Unis of Measurements
   a. Processor Speed
   b. Capacity Measurements
   c. Time and Space
4. Computer Level Hierarchy (Level 0 – 6)

5. Von Neumann Model
6. Non-Von Neumann Model
7. Parallel Computing
8. Number Representations
9. Positional Numbering Systems
10. Converting Between Bases
11. Unsigned Numbers
12. Signed Numbers: Signed-Magnitude, 1's Complement, 2's Complement
13. Signed Integer Representation
14. Floating-Point Representation
15. Character Codes
16. Boolean Algebra
    a. AND, OR, NOT
    b. Identities
    c. Canonical Forms
    d. Minterms
    e. Functions, truth tables, and Karnaugh Maps (KMaps)
17. Logic Gates
    a. Digital Components
    b. Combinational Circuits
    c. Multiplexer, Decoder

Some sample questions.

1. Convert unsigned binary number $(1101\ 1010.0101)_2$ to decimal number. Show your work.
2. Convert the unsigned octal number $(264.735)_8$ to hexadecimal number. Show your work.
3. Convert the binary number $(1101110011001.0110101)_2$ to hexadecimal number. Show your work.
4. One processor runs at 2.4 GHz. How many nanoseconds is one clock cycle for this processor?
5. Express the following decimal numbers 38_{10}, 86_{10}, -38_{10} and -86_{10} as an 8-bit binary number sign-magnitude form, 1's complement form, and 2's complement form.

Sign Magnitude				
1's complement				
2's complement				

6. Compute the result for $-38_{10} - 86_{10}$ using 8-bit 2's complement operation. Verify if the result is correct. If not, explain why.
7. Compute the result for $-38_{10} - 86_{10}$ using 8-bit 1's complement operation. Verify if the result is correct. If not, explain why.
8. Write the Boolean expression in canonical sum-of-product form and canonical product-of-sum form for the following truth table. Draw a Kmap with the truth table. Then, find the simplified Boolean expression.

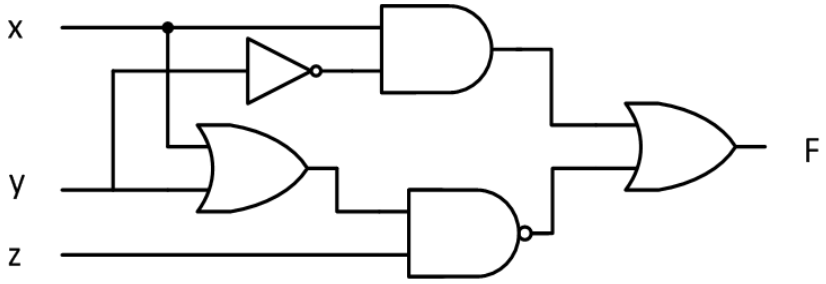
x	y	z	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

9. Use Boolean Identities to simplify the following Boolean functions utilizing the identity table. Show detailed steps to earn full credits and list Boolean identities applied for each step.

$$f(A,B,C,D) = \overline{(A+\overline{C}+D)(\overline{B}+C)(A+\bar{B}+D)(\overline{B}+C)(\bar{B}+C+\overline{D})}$$

Identity Name	AND Form	OR Form
Identity Law	$1x = x$	$0 + x = x$
Null (or Dominance) Law	$0x = 0$	$1 + x = 1$
Idempotent Law	$xx = x$	$x + x = x$
Inverse Law	$xx' = 0$	$x + x' = 1$
Commutative Law	$xy = yx$	$x + y = y + x$
Associative Law	$(xy)z = x(yz)$	$(x + y) + z = x + (y + z)$
Distributive Law	$x + (yz) = (x + y)(x + z)$	$x(y + z) = xy + xz$
Absorption Law	$x(x + y) = x$	$x + xy = x$
DeMorgan's Law	$(xy)' = x' + y'$	$(x + y)' = x'y'$
Double Complement Law	$x'' = x$	

10. The logic circuit shown in the diagram directly implements which of the following Boolean expressions?



a. $(xy')' + z'(x + y')$

b. $(yz') + z(x + y')$

c. $((x + y)z)' + xy'$

d. (x + y)'(xy' + z')