Name: _____

Exam Review 1 (up to 5 points extra credit)

Due to Gradescope by 1:00 PM on Wednesday, October 6th

You need to submit a pdf to Gradescope; failure to assign questions to pages will result in a 10% deduction on your grade

This extra credit opportunity CANNOT be accepted late.

Homework Goal: Practice the material we've covered up until Exam 1 and bring questions and confusions to class on Wednesday, October 6th

NOTE: The exam will be on Chapters 1-4 and part of Chapter 5 (zybooks 5.1 and 5.6). In addition to problems like the ones below, the exam will have true/false, fill in the blank, and multiple choice. You would be wise to study all the terminology we have learned in the class thus far; a set of definitions are available on Quizlet (link is posted on Piazza). Also, homework solutions are posted on Canvas under Files.

Chapter 1/5: Introduction and Algorithms

1. Write pseudocode that computes a running sum of numbers that the user enters. When they enter a negative number, stop adding the numbers and print out the total sum.

2. Write the output from the following pseudocode:

```
set count = 0
while count is NOT 7
        count = count + 2
        print count
```

3. Suppose a program has a user input a value for n. The program then executes the following pseudocode. What is the big-O time complexity of this algorithm?

```
read in a list of n values from a file
set counter to 0
for i from 0 to n-1
      print value[i]
      if value[i] is greater than 100
            add one to counter
            for j from 0 to n-1
                  divide value [j] by 2
                  print value[j]
print counter
```

4. Suppose the following sorted numbers exist in some list and you are looking for 403 via the binary search algorithm. What numbers would 403 be compared with to determine whether it is in the list or not (look left if you have a tie)?
   [101, 102, 250, 261, 262, 274, 306, 341, 358, 400, 403, 406, 442, 470, 471, 475]

Chapter 2: Binary

5. Complete the following conversions table:

Decimal	**Binary (unsigned)**	**Octal**	**Hex**
12	0000 1100	14	C
37			
	1010 0101		
		321	
			3F

6. You have the following 8-bit number: 1100 0110.
   What is its decimal representation in each of the following notations:
   a. Unsigned binary notation?

   b. Sign/magnitude notation?

   c. Two's complement notation?

7. You know that your machine stores a number using 5 bits. What is the range of numbers you can represent using:
   a. Unsigned binary notation?

   b. Sign/magnitude notation?

   c. Two's complement notation?

8. Assume your computer uses 8-bit 2's complement signed numbers. Perform the following additions, giving your answer in both binary and decimal. Indicate if overflow occurs.

   a.
   ```
     0 0 1 0 1 0 1 1
   + 0 1 0 0 1 0 0 1
   ```

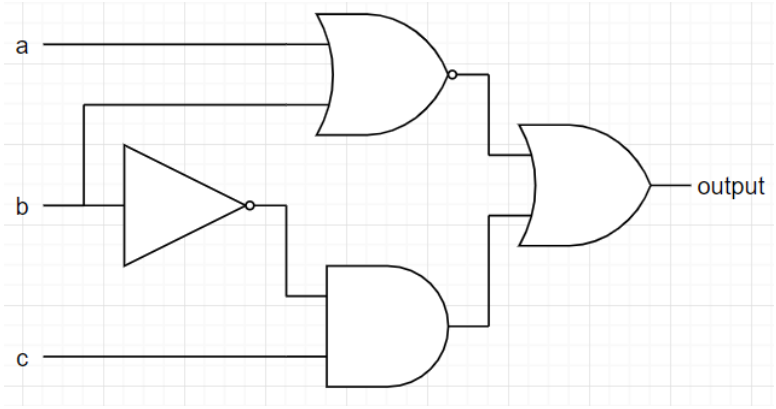
   b.
   ```
     1 0 1 0 0 1 1 0
   + 1 1 1 1 0 0 1 0
   ```

9. What color is this RGB pixel? `11111111 11111111 00000000`

10. Here is an ASCII message. What does it say? (If we ask you to translate ASCII on the exam, you will be provided with a table.)
    `01000111 01101111 01101111 01100100 00100000 01101100 01110101 01100011 01101011 00100001`

Chapter 3: Boolean Expressions, Truth Tables, Circuits

11. Given the following circuit diagram, create a truth table and Boolean expression.



12. Given the following truth table, create a Boolean expression and circuit.

a	**b**	**c**	**output**
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

Chapter 3: Hardware

13. RAM addresses (Remember to use 2^n not 10^m):
    a. If you have 11 bits available for RAM addresses, how many memory cells can theoretically exist?

    b. If you have 8 MB of memory, then how many bits are needed to represent all memory addresses?

14. Suppose Alexi's digital camera has a storage capacity of 4GB. What is the maximum number of photographs he can store in his camera if each picture is 1200 by 1800 pixels and each pixel requires 3 bytes of storage (RGB)?

15. Suppose it takes 3 ns to access Cache Memory from the CPU and 58 ns to access RAM from the CPU. Assume the Cache Hit Ratio is 80%. Compute the average access time in ns. Give your answer to two decimal points. (1 point)

16. Based on the numbers from (15), would it be better to increase the Cache Hit Ratio from 80% to 90% or to decrease RAM access time from 58 ns to 28 ns? Justify your answer.

17. Instruction Types
    a. Suppose Abdul designed a machine language with an opcode field of 5 bits. How many different instruction types can Abdul's language contain?

    b. Lola designed a system with 7 bits for the opcode. How many instructions does her language support?

Chapter 4: Software

18. List and describe the parts of an assembly language instruction.

Use the following table for questions (19) and (20).

Code	Assembly	Operation
00	sqrt	Square root
01	div	Division
10	add	Addition
11	sub	Subtraction

19. Write a program in assembly to compute $c = \sqrt{\frac{a-b}{a+b}}$. The addresses of a, b, c are M[4], M[5], and M[6], respectively. Also, assume M[7] is available for any intermediate answer.

20. Convert your assembly program from (19) into machine language. Use 2 bit op codes and 3 bit addresses.