## Final Exam Review (up to 7 points extra credit)

Due to Gradescope by 1:00PM on Wednesday, December 8<sup>th</sup> 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 can NOT be accepted late.

Homework Goal: Review the material we've covered over this semester and Bring questions and confusions to class on Wednesday, December 8<sup>th</sup>

1. Write pseudocode for a function that has the user enter the price for an item and the quantity purchased. The algorithm then displays the total cost of the purchase, including a x% sales tax (where x is a parameter of the function).

2. Create a truth table for the circuit shown below.



- 3. Suppose France has 65,086,098 citizens and that there is a database with everyone's name and cell number, sorted by full name (first name, middle name, last name). In the worst case, how many comparisons are required to find:
  - a. John Paul Bernard III?
  - b. The cell phone number 06 55 72 31 24?
- 4. Given the following 4-bit binary number, 1100, what is its decimal representation in each of the following notations?
  - a. Unsigned binary notation
  - b. Sign/magnitude notation
  - c. Two's complement notation
- 5. Two parts:
  - a. How would decimal 86 be represented in octal? What about in hex?
  - b. What is the number 10110.01 in decimal?

6. If a machine language supports 60 different instructions, how many bits of each instruction are needed to specify the opcode? What if the language supports 200 instructions?

7. What is the average access time with a 70% cache hit rate where RAM access times average 50ns and cache memory access times average 1ns? How does your answer change if the cache hit rate increases to 90%?

8. List the four most important tasks of an operating system and provide one sentence on what each task handles.

9. How long would it take to transmit a 5MB image over a dial up line (56 Kbps)? What is the speed up if the file is transmitted over a DSL line (1.5 Mbps)?

- 10. First, explain the difference between a substitution cipher and a block cipher. Then, define which type of cipher each of the following are:
  - a. Caesar Cipher
  - b. DES
  - c. AES
- 11. Suppose you want to investigate whether a person living near a garbage dump is more likely to get cancer. Briefly describe the four steps in this data science investigation and provide one task you would do in each step. Make your task as specific as possible.

12. What is Big Data? Be specific.

13. Briefly describe the difference between unsupervised and supervised machine learning. Use the terms *feature* and *label* in your description.

14. What is the difference between machine learning and deep learning? Use *neural networks* in your answer.