Final Exam Review – Homework #9 (8 points)
Due: Monday, April 29th, 2019 in class

Below are review problems to help you prepare for our final exam; problems are from exam 1 material, exam 2 material, and most recent material. NOTE: our final exam will also have true/false, fill in the blank, and multiple choice questions. You would be wise to study all terminology learned; a set of definitions can be found at https://quizlet.com/csci101/folders/csci101-spring-2019/sets.

1. Write pseudocode for a function that has the user enter 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
5. Two parts:
   a. How would decimal 86 be represented in octal? 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 are 50 nsec, on average, and cache memory access times are 1 nsec on average? How does your answer change if the cache hit rate increases to 90%? Comment on how cache hit rate affects (or does not affect) average access time. (1 point)

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)? Assume 1 Kbps = 1024bps, etc.
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. (1 point)


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