CSC 236 T11: Exam E1 Review

**This is a team assignment designed as an in-class activity.**

**Directions for use:**

* Place each of your questions in the area below the relevant header
* DO NOT PROVIDE ANSWERS WITH YOUR QUESTIONS

**1.1 & 1.2**

Comprehension:

1. Describe two benefits of using functional abstraction to tackle a large software project.

Knowledge:

1. A modern programming mechanism that allows the program to transfer control to a special section when an error occurs rather than leading directly to a “crash” is called
2. value error
3. exception handling
4. top-down design
5. the Python **except** clause

**1.3**

**Evaluation**

1. Which type of search is faster binary or linear? For whichever you chose, is it always faster than the other? Explain your answer in terms of Big O notation.

**Comprehension**

1. n = input ( ' enter n : ' )

for i in range (n) :

for j in range (n) :

print i , j

What would be the previous function’s asymptotic running time?

1. Theta(log2n)
2. Theta(n)
3. O(n)
4. O(n2)
5. None of the above
6. A code fragment that runs in a constant time regardless of the input would have an asymptotic speed of \_\_\_\_\_\_.

**Synthesis**

1. Write a pseudocode for a binary search in plain English (do not use Python coding).

**Ch 2**

**Comprehension:**

**T / F**: Operator overloading allows programmers to define methods to be called when

the built-in operators such as +, -, <, >, etc. are used with instances of the programmer-defined class.

**Knowledge:**

Which parts of the program description will be most helpful in identifying possible objects for a system design?

1. adjectives
2. nouns
3. verbs
4. all of the above

**Ch 3**

1. Assess the differences in the way that arrays and Python lists handle types, and what the advantages and disadvantages are of each.
2. When working with Python lists, why does the append operation take ϴ(1) but the insert and delete operations take ϴ(n)?
3. What will the following dictionary look like after the del suits[‘j’] take place?

>> suits

{ ' h ' : ' Heart s ' , ' e ' : ' Clovers ' , ' j ' : ' Joker ' , ' s ' : ' Shovels ' , ' d ' :

' Diamonds ' }

>> del suits [ ' j ' ]

**Big O**

Comprehension Level:

1. Briefly describe what the Big-O notation is used for in Computer Science.

Comprehension Level

1. On Planet Calibous, if you need to withdraw money from the Calibousic National ATM bank, you can only do so by withdrawing one dollar ($1) at a time. What is the Big-O notation of this?

Application Level

1. There is a deck of cards and there is a function that loops through the deck to remove the biggest card every time it loops. After the function has looped once, it has now n-1 items (n is the number of items in the list) to go through in the list to remove the next item, then n-2, etc… Determine the Big-O for this function.

**4.1, 4.2, 4.3**

Evaluation Level

Is it more efficient to add an element to the beginning of a Python list or the beginning of a linked list? Explain.

**Knowledge Level**

A \_\_\_\_\_\_\_\_\_ stores a data element and a reference or multiple references to other linked structures.

**4.4, 4.5, 4.6, 4.7**

Comprehension

1. Describe the primary purpose of a constructor in a Python class.

Application

1. In what scenario would one need to use a deep copy as opposed to a shallow copy?

Knowledge

1. What is the beginning of a linked list called?
2. Front
3. Top
4. Lead Node
5. Head

Knowledge

1. A\_\_\_\_\_\_\_\_\_\_\_\_\_is a  set of properties that must be true before and after each method of a class is executed.

**Section 4.5 of *Data Structures and Algorithms using Python and C++***

Comprehension

Describe a situation when there is an advantage for using a linked structure over a Python list using Big O notation.

Knowledge

True or False: yield is a Python keyword that prevents the code from picking up where it left off and clears out any values that have been yielded.

Given the following code what would the generator produce in the sequence (This question might be worded wrong or very confusing?)

def squares( ) :

        num = 1

        while True:

       yield num \* num

            num +=1

**Section 4.6 of *Data Structures and Algorithms using Python and C++***

Application

Explain in your own words how you would utilize pointers when inserting into the beginning of a linked list so as to NOT lose the rest of your references after your insertion.

Knowledge

Fill in the blank: A \_\_\_\_\_\_\_\_\_\_\_ encapsulates the idea of a position in a linked list.

**Section 4.7**

Comprehension:

Describe two drawbacks of implementing a Linked List

Knowledge

True or False: In a non-empty linked list data structure, a typical node contains a reference or references to other nodes.

**Ch 5**

Knowledge

1. What do “LIFO” and “FIFO” stand for and what data structures are they associated with? Give an example for each of when one might use a data structure over the other and why it is the better choice for that example.

Knowledge

1. Define enqueue and dequeue.

**A1**

Application:

Recall the Beetle game. Write some Pseudocode describing an algorithm of how you can compare one body part against a dice value that returns True if they match or False if they do not match. Use any data type of your choice.

Knowledge:

True or False: You can only store beetle information in Python dictionaries.

**A2**

Knowledge:

1. Which of the following is NOT something Google primarily looks for in new hires:
   1. General cognitive ability/learning ability
   2. Emergent leadership skills
   3. Humility
   4. A high GPA
   5. Expertise
2. If a friend was preparing for a job interview with Google or another company in a computer science field, what sort of advice would you give her? What is important for her to be able to do and what sort of qualities are looked for? Why?

**A3**

A3:

**Knowledge:**

1. You want to copy the words from a text file using Python. Which of the following will work correctly?
2. open\_file = open(words\_file, ‘copy’)

contents = words\_file.copy()

1. open\_file = open(words\_file, 'read')  
   contents = words\_file.copy()
2. open\_file = open(words\_file, 'r')

contents = open\_file.readlines()

1. open\_file = open(words\_file, 'c')

contents = open\_file.readlines()

**Knowledge:**

1. To do a binary search in Python, you must first sort the list. write a line of code that will sort the following list: [“I”, “really”, “like”, “using”, “python”]

**Knowledge:**

1. What will the list above look like once it is sorted?

**A5**

**Knowledge:**

def \_\_init\_\_( self ):

      self.fuel\_level = 0;

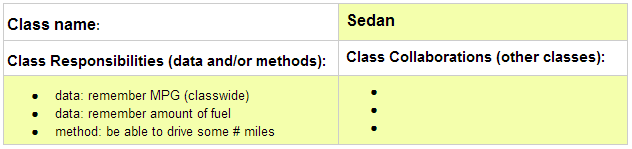
What kind of variable is fuel\_level?

1. Local Variable
2. Instance Variable
3. Global Variable
4. Class Variable
5. None of the above; it is not a variable

**Analysis**:

Pick an object from your home (or dorm) or school and create a CRC Card for it.

Example:



**A6**

Knowledge

1. Describe what a Markov chain is and what it does.
2. Using a Markov chain on the following string what would be the value for the key ‘the’?

“the cat in the hat sat on the fat lady. Then the cat sang the song happy birthday.”

1. {‘the’ : (‘cat’, ‘hat’, ‘fat’, ‘cat’, ‘song’)}
2. {‘the’ : (‘cat’, ‘hat’, ‘fat’, ‘song’)}
3. {‘the’ : ()}
4. {‘the’ : (‘cat in’, ‘hat sat’, ‘fat lady’, ‘cat sang’, ‘song happy’)}

**A7**

In the short article we read for A7 by Robert Love, engineer at Google, he emphasized the importance of what when it comes to computer science?

1. A deep love of learning and problem solving
2. visualizing data structures and knowing when to use different structures and algorithms
3. understanding the difference between memory and ram
4. a college degree and experience in Python

Please analyze and assess the improper data structures for the scenario below:

“How would you design a cell phone’s contact list that gives you the contacts that have their first or last names that contain certain letters you type in? For example, If you press “M” it will tell you all the contacts starting with “M”. If you then press “MI”, it will tell you all the contacts starting from “MI” and so forth....”

**A8**

**Knowledge**

1. What is the last thing you have to do right before you run your C++ program, in order to run it?

**Knowledge**

1. What vital syntactic component is missing from this C++ code snippet?

int main()

   cout << "Hello world!" << endl;

   return 0;

**Application**

1. Write a Python program that does the same thing as the C++ program in question 2 (with correct syntax in question 2). Explain a major difference between these programs.

**Knowledge**

1. A \_\_\_\_\_\_\_\_\_ transforms source code into a binary form of code known as object code (aka machine code), which is stored in an object file.

**A10**

**Comprehension:**

1. Explain the binary number system in a few sentences.

**Knowledge:**

1. **T/F**   Linked lists can be used to store binary numbers.

**Knowledge:**

1. What does the arrow (https://docs.google.com/drawings/d/sp1QO5MsYNq9RuWEdIO7fmQ/image?w=34&h=20&rev=1&ac=1) notation in the abstraction for the nodes of the linked list represent?

**A11**

**Topic: A11**

**Example of an application level question:**

1. Write out the binary value of the decimal numbers below:
2. 3
3. 15
4. 33
5. 67
6. Add the binary values and write the decimal value of its sum:

110110      100010         111

+    101     +   1001    + 1111

**A12**

Comprehension Level:

1. If, “in each round of play, both players will (essentially simultaneously) remove a card from the top of their playing piles, displaying them face-up on the table where they can be seen by both players.” what possible choices of data structure(s) would be used for implementing the player piles?  Name an additional piece of information which would be needed to more specifically determine the choice? Explain.

Knowledge Level:

1. A *queue* can also be referred to:
2. FIFO - first in, first out
3. LIFO- last in, first out
4. LILO- last in, last out
5. Both a and c
6. Both b and c
7. Both a and b

Application Level:

1. Show how a stack ADT works by using a real life example to describe the functionality.

**L1**

1. In the L1 lab we worked with embedding messages into a image. In that lab one of the overarching concepts was shallow copy vs. deep copy. In your own words describe the difference between shallow copy and deep copy.
2. In pseudocode describe how you would take RGB values like in lab L1 (123,123,123) and encrypt one of the values. **Remember use just pseudocode.**
3. After you have made your pseudocode explain how you could use the concept of encryption learned in lab L1 in the real world? Justify your answer in detail.

**T1**

Knowledge Level:

1. What do the *pre* and *post* conditions indicate in a docstring?

Knowledge Level:

1. What are some of the advantages of top-down design when implementing functions?

Knowledge Level

1. The condition that allows one to know the outcome of a function is:
2. *post*-condition
3. *pre*-condition
4. *past*-condition
5. *outcome*-condition

**T2**

**(Comprehension)**

Explain why it is a good idea to have notation for what a function does when creating a function shell.

**(Application)**

When implementing functional abstraction (each person in a team individually implements one function) why is a more detailed design better than a vague design full of assumptions?

**T3**

Comprehension

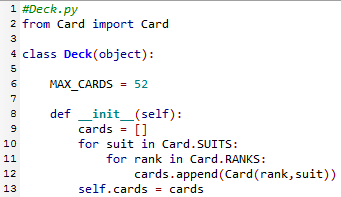
1. Give a scenario in which you would want to use a binary search method instead of a linear search method. Explain.
2. In a paragraph of complete sentences, describe the relationship between binary search and linear search.

Application

Identify one way that you can quantify and measure the speed of an algorithm.  Identify one way that you can quantify and measure the relative efficiency of an algorithm.  Describe how these differ and why this difference is important.

**T4**





In the above code fragment from a class called Deck, give an example of a class variable, an instance variable, and a local variable. Contrast these three types of variables.

1. In \_\_\_\_\_\_\_\_\_\_\_\_, classes, which are blueprints for creating (or instantiating) objects, can be thought of as “black boxes” (meaning that the clients of the code do not need to understand what is happening within the boxes as long as they understand the output).
   1. Top-down design
   2. Object oriented design
   3. CRC card planning
   4. Lists

**T5**

A class may or may not have collaborations with other classes. Give a specific example of a collaboration among classes.

A class makes a blueprint for objects of that data type and is usually described by a    \_\_\_\_ during the design process.

**T6**

Knowledge

1. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is a formal way of describing an upper bound on the resources required by an algorithm for an input of a size N.
2. def f2(L):  
      sum = 0  
      i = 1  
      while i < len(L):  
          sum = sum + L[i]  
          i = i \* 2  
      return sum

Let n be the size of the list L passed to this function. Which of the following most accurately describes how the runtime of this function grow as n grows?

1. it grows in a linear fashion
2. it grows quadratically
3. it grows less in a linear fashion
4. it grows more than quadratically

T6:      **Comprehension**

1. If it takes a function the same amount of time to do an operation no matter how large the input what is the Big-O analysis and the reason?
2. O(N) = 1 because 1 is the basic unit of operation and this remains unchanged through the operations
3. O(N) = N because the program has to deal with N things as it runs
4. O(N) = 1 because it takes the same amount of time to do a process no matter how many things the process goes over
5. O(N) = N because input is in the form of an array and to access the elements of the array, the program has to access the address of each element in the array in memory

**Application**

1. Assume that there is a banking system that uses a monetary unit called a cubit. In this banking system, for you to get your money you need to guess a number that the teller is thinking, which is between 0 and the amount of cubits you request. If you want to withdraw 2048 cubits and use a binary search algorithm to guess the teller’s number:
2. what are the all the guesses that you can make?
3. what is the maximum number of guesses that you can make?
4. what is the Big-O complexity of the algorithm used?

**Synthesis**

1. Compare and contrast the scalability of the binary algorithm and the linear algorithm for large values of N.

**Knowledge**

1. What does it mean if an algorithm is said to scale well?

**T6**

Why wasn’t a college degree listed as an important part of an interview?

What are most interview questions about?

**T7**

**Synthesis:**

1. Given the following information,

|  |
| --- |
| dict = {'key1':'value1', 'key2':'value2', 'key3':'value3'}  dict.keys() #Gets all keys  dict.values()#Gets all values  dict['key2'] = 'newvalue'  dict.update({'key2': 'newvalue'})  del dict['key2']  print dict['key2'] # prints ‘value2 |

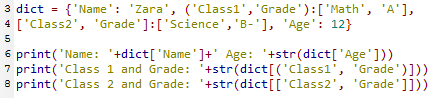
fix the following dictionary so that 'A' is 'excellent', 'B' is 'very good', 'C' is 'satisfactory', ‘D’ is ’poor’, and ‘F’ is ‘failing’}:

|  |
| --- |
| grd = {'A':’devastating’, 'B':'', ‘D’:’satisfactory’, ‘F’: ‘passing’} |

**Application:**

1. Fill in the Key: Value for the Descriptions given

|  |  |
| --- | --- |
| **Descriptor** | **Key:Value** |
| U.S.A. taxpayers | social security number: name |
| Courses offered at Berea College |  |
| Credit Card |  |
| Entry in a Dictionary |  |

1. What is a collision and why might a collision occur with a hashing function? What consequences might result from this problem?
2. 

What will happen if this code is run? Explain what occurs and why.

**T8**

1. A region of physical memory storage that is used to temporarily store data while it is being moved is referred to as a \_\_\_\_\_\_\_\_\_.
2. Compare and contrast the ways in which Python and C++ handle buffer overflow.

**T9**

Comprehension Level:

1. What are the differences between a linked list and an array list?

Application Level:

1. Give an algorithm to increment a binary number by 1. Apply your algorithm to at least three binary numbers. Ex(1011101, 10010, 1111).

Knowledge Level:

1. What is an “edge” referred to as?
2. input values that require special handling
3. output values that require special handling
4. instance variables that measure bits
5. a carry adder

**T10**

If someone only gets their work done if the due date is coming up are they using a queue or stack? What additional information would you need in order to determine which data structure to use?

**(Comprehension)**

List a situation when you would use a stack and a situation when you would use a queue.

**(Application)**