Assignment 3

● Graded

Student

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Total Points

41.5 / 56 pts

Question 1

(no title)

6 / 8 pts

✓ **– 2 pts** You have incorrect or unrelated information in your answer

💬 Environment binds names to memory locations, not involving values or data types. Additionally, memory should be described as a binding of memory locations to values.

Question 2

(no title)

4 / 8 pts

Stack Object Definition

✓ **– 2.5 pts** Answer missing stack allocation

✓ **– 1.5 pts** Answer missing that objects are allocated/deallocated in LIFO order

Question 3

(no title)

6 / 8 pts

✓ **– 2 pts** Did not say that we are iterating over the string to find the null terminator

Question 4

(no title)

8 / 8 pts

✓ **– 0 pts** Correct

Question 5

(no title)

5 / 8 pts

✓ **– 1.5 pts** Garbage collection is a runtime process which identifies any garbage in memory and frees it

✓ **– 1.5 pts** Automatic reference counting is when the compiler injects allocation and free statements into the source code at compile time

Question 6

(no title)

8 / 8 pts

✓ **– 0 pts** Correct

Question 7

(no title)

4.5 / 8 pts

✓ **− 3 pts** Missing or incorrect definition of garbage: memory that has been **allocated in the environment** but has become **inaccessible to the program** because it has gone out of scope, meaning the number of references to it have dropped to zero

✓ **− 2.5 pts** Yes, garbage exists in Java before being deallocated by the garbage collector.

💬 **+ 2 pts** Point adjustment

Q1

8 Points

Define the symbol table, environment, and memory in the context of binding.

The symbol table is a table that tracks all of the binds between things such as variables or functions/methods. It keeps track of the data type or the data type returned and the visibility of that data, whether it's global or local to a function/method or a class. The environment is the process of binding a variable or a value to a data type or place to hold memory. Memory is where the data is stored 'physically' on the machine that the code is running on.

Q2

8 Points

Name and define the three storage allocation methods defined in lecture

The three storage allocation methods defined in lecture were static storage, stalk storage, and heap storage. Static storage is storage that needs to be saved forever and will not change. Stalk storage is for data that must be stored temporarily, but will eventually be discarded. Heap storage is used for saving data that needs to be dynamically expanded or reduced and requires frequent maintenance.

Q3

8 Points

In most modern languages, Strings are an object. But C does not support the object-oriented paradigm. What are Strings in C? How do you determine the end of a C String?

In C, Strings behave similar to how arrays are formatted in Java, where you define them with square brackets. Strings are alike arrays, but instead of holding various data, they only hold each individual character of a string. You determine the end of a C String by either manually defining it using \0 or by defining it like a string, such as char word[] = "Word";, almost like a Java String, but with a different data type instantiation.

Q4

8 Points

Languages like Java and Python allow forward references of functions but C does not. Why is C unable to support forward references of functions? Why are Java and Python able?

C is unable to support forward references of functions because C compiles code in the way humans read, which would be from left to right, top to the end of the code. Unlike Java and Python, where they make it easier for the program and will search for functions and methods even if they are made after the function call. To clarify, C doesn't read through the code the same way as Java and Python and cannot detect methods/functions that are declared after they are called in the functionality of the code.

Q5

8 Points

Name and define the three types of memory management discussed in lecture.

The three types of memory management discussed in lecture were manual, garbage collector, and automatic reference counting. Manual memory management is similar to C, where the programmer has full control of what variables and data is kept and how it is stored, but it can easily break if the programmer does not know what they are doing. Garbage collector memory management is similar to Java and the programmer does not have to worry about memory management. There are some things that can be handled by the programmer such as closing the scanner, but otherwise, it is all automated within the programming language. Even though this gives the programmer less freedom and control of the memory management, the program is less likely to break due to some funky code. Automatic reference counting memory management is a combination of manual and garbage collector memory management. It will automatically do the memory management, but also allows the programmer to modify the memory management functionality as well.

Q6

8 Points

What is a dangling reference? Can dangling references exist in C? In Java? Why or why not?

A dangling reference is when a reference still exists to a specific memory location, but does not actually have a use anymore. Dangling references can exist in C because when you free up the memory space, it might still keep the pointer of where the memory once existed. In java, dangling references do not exist since data isn't stored in separate references like C where you have a location and a pointer and since the whole process is automated, it's not necessary and it will automatically get rid of the value and memory location.

Q7

8 Points

What is garbage? Can garbage exist in C? In Java? Why or why not?

Garbage is memory locations that are no longer usable. Garbage can exist in C since the programmer may forget to use the free command in order to free up that memory location and just have deleted the pointer, which would technically make it unusable to a degree in the code since it would not fully exist.