**Q1: Answer The Following Questions with Short Answers**

1. What is the potential danger of case-sensitive names in a programming language?
2. Which category of C++ reference variables is always aliases?
3. Some programming languages are typeless. What are the obvious advantages and disadvantages of having no types in a language?
4. How does a decimal datatype waste memory space?
5. What are all of the differences between the enumeration types of C++ and those of Java?
6. Search and write a comparison of C’s malloc and free functions with C++’s new and delete operators. Mention about safety in the comparison.

**Q2:** Consider the following skeletal C program:

**void** fun1(**void**); /\* prototype \*/

**void** fun2(**void**); /\* prototype \*/

**void** fun3(**void**); /\* prototype \*/

**void** main() {

**int** a, b, c;

. . .

}

**void** fun1(**void**) {

**int** b, c, d;

. . .

}

**void** fun2(**void**) {

**int** c, d, e;

. . .

}

**void** fun3(**void**) {

**int** d, e, f;

. . .

}

Given the following calling sequences and assuming that dynamic scoping is used, what **variables** are **visible** during execution of the **last function called**? Include with each visible variable the name of the function in which it was defined.

a. main calls fun1; fun1 calls fun2; fun2 calls fun3.

b. main calls fun1; fun1 calls fun3.

c. main calls fun2; fun2 calls fun3; fun3 calls fun1.

d. main calls fun3; fun3 calls fun1.

e. main calls fun1; fun1 calls fun3; fun3 calls fun2.

f. main calls fun3; fun3 calls fun2; fun2 calls fun1.

|  |  |  |
| --- | --- | --- |
| Question | Visible variables | Function where the variable declared |
| a |  |  |
|  |  |
|  |  |
|  |  |
| b |  |  |
|  |  |
|  |  |
|  |  |
| c |  |  |
|  |  |
|  |  |
|  |  |
| d |  |  |
| e |  |  |
| f |  |  |

**Q3:** Consider the following Python program

x = 1;

y = 3;

z = 5;

def sub1():

a = 7;

y = 9;

z = 11;

...

def sub2():

global x;

a = 13;

x = 15;

w = 17;

...

def sub3():

nonlocal a;

a = 19;

b = 21;

z = 23;

...

...

Similar to Q2, list all the variables, along with the function where they are declared, that are visible in the bodies of sub1, sub2 and sub3 assuming static scoping is used.

|  |  |  |
| --- | --- | --- |
| variables | function where they are declared | Where it is visible |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Q4:** Write three functions in C or C++: one that declares a large array statically, one that declares the same large array on the stack, and one that creates the same large array from the heap. Call each of the subprograms a large number of times (at least 100,000) and output the time required by each. 1)Include the code, 2)run snapshot show that time of each function, and 3) explain why you get this results.