Eastern Mediterranean University
Department of Computer Engineering

CMPE 318 Final Exam
2018 – 2019 Spring Semester
21 June 2019

Name, Surname : _____

Student No : _____

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Duration: 100 minutes

INSTRUCTIONS:

1. **Please answer all questions.**
2. **Do not ask any question to the invigilator.**
3. **GSM phones are not allowed in the exam room.**

1. We are given the following program in a new imperative programming language Tau. Its statements have the usual meanings and are similar to 'C'. Parameters are always passed by value.

```
void main() {

     int y=2;

    void g(int x){

            void f(int y){
                    h(y,8);
              }

             k(x);
             f(x);
        }

     void h(int w, int j){
            int z = 4;
            print "**********";

       }

     void k(int y){
          y=y+3;
      }


   g(y);
}
```

Assume Tau is statically scoped, and static links are used to maintain scope information. For the Tau program above, show the contents of the system stack at the point the *print* statement is being executed. Assume *main()* is the first function to be called. (14 pts)

2) Assume that Tau is statically scoped, and we have the following Tau program.

```
void main() {
   int x = 2;
   int y = 5;
   int z = 8;

   void  f(int z){
        int y=9;
        x = x+2;
       void  g(int x){
           z=z+y;
           print "g:", x+y+z ;
           x++;
           y=x+3;
        }
        y=y+x;
        g(y);
        x++,
        print "f:", x+y+z;
    }

   f(x);
   print "main:", x+y+z;
}
```

(note: "print" displays its parameter, and then a new line)
What is the output of the program if Tau uses the

a) By-value parameter passing mechanism ? (6 pts)

b) By-reference parameter passing mechanism ? (6 pts)

c) By-value-result parameter passing mechanism ? (6 pts)

3) Assume we have the following class definitions in the object-oriented programming language T++, which is similar to Java. Assume all method calls are bound dynamically in T++.

```
class P {
   static int x;
   void m(){ ...} // address 100
   void n() {.....}  // address 200
}

class C is subclass of P  {
   char y;
   static int w;
   void n(){.....} // address 300
   void r(){....}  // address 400
   void k() {….}  // address 600

}

class D is subclass of C {
   float z[5];
   void n(){……} // address 500
   void q(){…….} // addres 700

}
```

Show the virtual method table for the class D. (10 pts)

How many bytes does an instance of class D occupy? Assume an integer occupies 4 bytes, a float occupies 8 bytes and a pointer occupies 4 bytes. (4 pts)

4) Given the following Haskell program,

```
repl a b [] = []
repl a b (h:t) | a < h     = (h+a):(repl b a t)
               | otherwise  = (h*b):(repl a b t)
```

what is the value of the expression ***repl 5 6 [3,4,5,6,7]*** **? (10 pts)**

_____

5) What is the value of the following SCHEME expression ? (6 pts)

(CONS (CDR '(A B C)) (CDR '(D E F G)))

Ans: _____

6) Define in Haskell the function ***howmany*** **which takes two parameters,** ***elem*** **and** ***a_list*****, and returns how many elems are in** ***a_list*****. For example,** ***howmany 'b' ['a', 'b', 'c', 'b','s']*** **should return 2. (8 pts)**

7) Fill in the blanks. (2 pts each)

i. **A/An _____ class cannot be instantiated.**

ii. **Class instances are called _____ .**

iii. **Subprograms that define operations on objects are called _____ .**

iv. **A _____ variable can reference (or point to) objects of the class and objects of any of its descendants.**

v. **A/An _____ is one that does not include a definition (it only defines a protocol)**

8) True/False. Grading: 2 points for a correct answer, -1 point for an incorrect answer, 0 point for no answer.

i. **Local variables in a function are allocated space in the activation record of the function when the function is called. _____**

ii. **A coroutine is a subprogram that has multiple entries and controls them itself. _____**

iii. **The dynamic link always points to the base of the activation record instace of the calling function. _____**

iv. **In the deep access implementation of dynamic scoping, non-local references are found by searching the activation record instances on the dynamic chain. _____**

v. **In a C++ class definition, if a variable is declared in the scope of a "private" clause, then that variable is not visible in child classes.**

_____

vi. **A destructor is an implicitly called method, mainly used to initialize the data members of an instance. _____**

vii. **Two primary features of ADTs are the packaging of data with their associated operations and inheritance _____**

viii. **Class methods in C++ have an extra "this" parameter _____**

ix. **Smalltalk is fast compared with conventional compiled imperative languages. _____ .**

x. **In C++, a method can be defined to be virtual, which means that they can be called through polymorphic variables and dynamically bound to messages. _____ .**

********** Good luck!!!! **********