Assignment 5

Due: 4:25pm Dec.9th (Wed.)

This assignment is done by a group of 2or 3 students (each group submits only 1 copy of the assignment)

Input/output format (including the function name and the number of arguments) – 5 points

1. [10 points] Write a Prolog predicate **max(L,Res)** that computes the maximum number in an integer list L and stores the result in Res. Assume that L contains at least 1 element.
E.g. |?-max([1,3,5,4,2], Res).
Res = 5 //5 is the maximum number in the list

2. [15 points] Define a Prolog predicate **insertNTerm(N,T,Res)** that insert 1 immediately after **every Nth** argument of a term T and store the results in Res.
E.g. | ?- insertNTerm(3,f(2,3,4,5,6,7,8),Res).
Res = f(2,3,4,1,5,6,7,1,8).
no

3. [15 points] Write a Prolog predicate **sublist(L, Res),** which computes a list of all sublists of L and stores the result in Res.
E.g. ?- sublist([1,2],Res).
Res = [[],[1],[2],[1,2]] or [[1,2],[],[1],[2]], or [[1],[],[2],[1,2]] etc.
?- sublist([1,2,3],Res).
Res = [[],[1],[2],[3],[1,2],[1,3],[2,3],[1,2,3]], or [[1,2,3], [], [1],[2],[3],[1,2],[1,3],[2,3]] etc.

4. [15 points] Write a Prolog program **position(X, L, Res)** that takes an integer X and an integer list L, returns a list of positions of X in L. The result is stored in Res.
e.g. |?- position(1, [1,3,1,2,5,1], Res).
Res = [1,3,6].
No

5. **[10 points]** Given two lists L1 and L2 that are **sorted in ascending order**, write a prolog predicate **merge(L1, L2, Res)** that computes a list Res which contains all elements of L1 and L2 and **is sorted in ascending order**.
e.g. | ?- merge([1,3,4,6],[2,3,5],Res).
Res = [1,2,3,3,4,5,6].

6. [10 points] Given the following code in Java

```
public class A
{ public void p() { System.out.println("A.p");}
  public void q() { System.out.println("A.q");}
  public void r() { p(); q();}}

class B extends A
{ public void p() { System.out.println("B.p");}}

class C extends B
{ public void q() { System.out.println("C.q");}
  public void r() { q(); p();}
}
…
A a = new B();
a.r();
a = new C();
a.r();
```

What does the above program print?

7. [10 points] Question 10.20 Given the following code in C++:

```
class A{
  public:
        virtual void p(){cout << "A.p"<< endl;}
        void q(){cout << "A.q" << endl;}
        virtual void r(){p(); q();}
};
class B: public A{
  public:
        void p(){cout << "B.p" << endl;}
};
class C: public B{
  public:
        void q(){cout << "C.q" << endl;}
        void r(){q(); p();}
};
…
A a; C c; a = c; a.r();
A* ap = new B; ap -> r();
A* ap1 = new C; ap1 -> r();
```

What does the above program print?

8**. [10 points]** Question 10.48

```
Class A
{ public:
        virtual void f();
        virtual void g();
  private: int a;
};
class B: public A
{ public:
        void f();
        void h();
  private: int b;
}
Class C: public B
{ public: void g();
  Private: int c; }
```

Draw the VMT of each class and the layout of memory for a dynamically-allocated object of each class.

Instruction of Submission:

- Create a directory [userid]_5 (e.g. pyang_5), which contains
  - Prolog program **assignment5.P (questions 1—5)**
  - **assignment5.pdf (questions 6-8)**
  - a README file (text file, do not submit a .doc file) which contains
    - Names, email addresses, section #s of the group members
    - Whether your code was tested on bingsuns.
    - (optional) Briefly describe anything special about your submission that the TA should take note of if there is any.
- Tar the contents of this directory using the following command.
  tar –cvf [directory_name].tar [directory_name]
  E.g. tar -cvf pyang_5.tar pyang_5/
- Use the Blackboard to upload the tared file you created above.

Academic Honesty:

All students should follow Student Academic Honesty Code (http://watson.binghamton.edu/acadhonorcode.html). All forms of cheating will be treated with utmost seriousness. You may discuss the problems with other students, however, you must write your OWN codes and solutions. Discussing solutions to the problem is NOT acceptable. Copying an assignment from another student or allowing another student to copy your work may lead to an automatic **F** for this course. If you borrow small parts of code/text from Internet, you must acknowledge this in your submission. Also, you must clearly understand and be able to explain the material. Copying entire material or large parts of such material from the Internet will be considered academic dishonesty. Moss will be used to detect plagiarism in programming assignments. You need ensure that your code and documentation are protected and not accessible to other students. Use **chmod 700** command to change the permissions of your working directories before you start working on the assignments. If you have any questions about whether an act of collaboration may be treated as academic dishonesty, please consult the instructor before you collaborate.