CISC 3150
Sample Midterm Exam

Question 1: Briefly describe each of the following concepts.

1.1 Dynamic binding

1.2 Overriding

1.3 Polymorphism

Question 2: Give the output of each of the following programs.

Java
```java
class A {
      public String toString(){
        return "x="+getX();
      }
      int getX(){ return x;}
      int x = 2;
}
class B extends A {
      int getX(){ return x;}
      int x = 1;
}
class C extends A {
       int getX(){ return x;}
       int x = 3;
}
class Test {
  public static void main(String[] s){
    A o1 = new B();
    C o2 = new C();
    System.out.println(o1.toString());   //  Output is _____
    System.out.println(o2.toString());   //  Output is _____
  }
}
```

C++
```cpp
class parent {
  public:
    virtual void show(){
      cout << "show in parent" << endl;
    }
    void m(){
      cout << "m in parent" << endl;
    }
};

class child: public parent {
  public:
    void show(){
      cout << "show in child" << endl;
    }
    void m(){
      cout << "m in child" << endl;
    }

};

int main(){
```

```
      parent* parent_object_ptr = new child;
      parent_object_ptr-> show();    //  Output is _____
      parent_object_ptr-> m();       //  Output is _____
      return 0;
    }
```

Question 3

Write the following functions in Java or C++.

1. `min_max_median(lst)`: This function returns a list that contains the minimum, the maximum, and the median numbers of a given list `lst`. If `lst` has an odd number of elements, then the median is the number that separates the higher half from the lower half. If `lst` has an even number of elements, then the median is the mean of the two middle values.

2. `sum_assoc(lst1,lst2)`: This function takes two lists of the same length and returns a list that contains the sums of the corresponding pairs. For example, if `lst1` is [1,2,3], and `lst2` is [7,8,9], then the returned list is `[8,10,12]`.

3. `repli(lst,n)`: This function replicates the elements of lst n times. For example

    `repli(['a','b','c'],3)`

    returns `['a','a','a','b','b','b','c','c','c']`.

Question 4

The following gives a partial impelemtation of a class named `MyList`. A `MyList` object is a singly-linked list, where the first node is referenced by the variable `head`, and the last node is referenced by the variable `tail`.

```
class ListNode<E> {
    public ListNode(E data, ListNode<E> next){
        this.data = data;
        this.next = next;
    }

    public E data;
    public ListNode<E> next;
}


class MyList<E> implements List<E> {
    ...

    private ListNode<E> head, tail;
}
```

Implement the following methods:

- `lastIndexOf(o)`: returns the index of the last occurrence of `o`.

```
        public int    lastIndexOf(Object o);
```

- `equals(o)`: returns true if `o` equals this list. Two lists are equal if they have the same size and the elements are pair-wisely equal.

```
        public boolean    equals(Object o);
```

Question 5

(extra credit, from EPI)

- Write a program that tests whether a singly linked list is palindromic.

- You are given an array of strings. Compute the k strings that appear most frequently in the array.