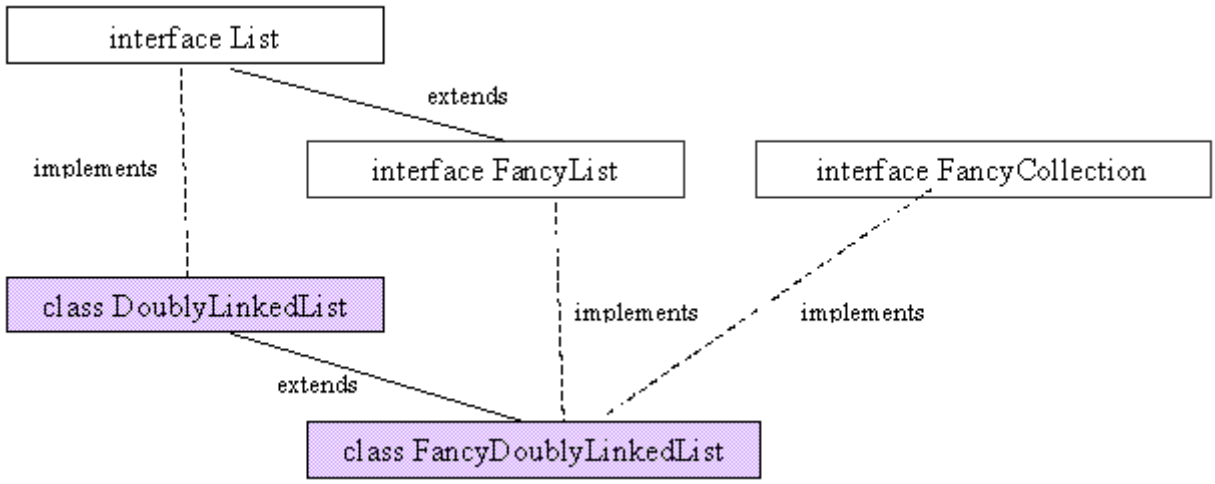
Дисциплина: *СД и ООП* **Тема:** *Списък*
Специалност: *КН 1 курс, 3 и 4 групи* **Дата**: *21.04.2010 г.*

Задача 1: Дадена е йерархията от интерфейси и класове:



Интерфейсът **List** представя операции на *списък с елементи от тип* ***Object***:

```
public interface List {
        public boolean add(Object element);
        public void add(int index,Object element);
        public void addFirst(Object element);
        public void addLast(Object element);
        public boolean contains(Object arg);
        public Object get(int index);
        public Object getFirst();
        public Object getLast();
        public int indexOf(Object element);
        public int lastIndexOf(Object element);
        public boolean isEmpty();
        public Iterator iterator();
        public Object remove(int index);
        public Object remove(Object element);
        public Object removeFirst();
        public Object removeLast();
        public Object set(int index,Object element);
        public int size();
        public String toString();
}
```

Интерфейсът **FancyList** представя операции над списъци:

```
public interface FancyList extends List {
        public boolean containsAll(FancyList c);
//Returns true if this list contains all of the elements of the specified collection
        public boolean addAll(FancyList c);
//Appends all of the elements in the specified collection to the end of this list, in the order that they are returned by the
//specified collection's iterator
//Returns true if this list changed as a result of the call
//Throws:
//    UnsupportedOperationException - if the addAll operation is not supported by this list
        public boolean addAll(int index, FancyList c);
//Inserts all of the elements in the specified collection into this list at the specified position. Shifts the element currently
//at that position (if any) and any subsequent elements to the right (increases their indices). The new elements will
//appear in this list in the order that they are returned by the specified collection's iterator
//Returns true if this list changed as a result of the call
//Throws:
//    UnsupportedOperationException - if the addAll operation is not supported by this list
//    IndexOutOfBoundsException - if the index is out of range (index < 0 || index > size())
```

```
        public boolean removeAll(FancyList c);
//Removes from this list all of its elements that are contained in the specified
//collection
//Returns true if this list changed as a result of the call
//Throws:
//    UnsupportedOperationException - if the removeAll operation is not supported by this list
        public boolean retainAll(FancyList c);
//Retains only the elements in this list that are contained in the specified collection. In other words, removes from this
//list all the elements that are not contained in the specified collection
//Returns true if this list changed as a result of the call
//Throws:
//    UnsupportedOperationException - if the retainAll operation is not supported by this list
        public FancyList subList(int fromIndex,int toIndex);
//Returns a view of the portion of this list between the specified fromIndex, inclusive, and toIndex, exclusive. If
//romIndex and toIndex are equal, the returned list is empty
//Throws:
//    IndexOutOfBoundsException – if (fromIndex < 0 || toIndex > size() ||  fromIndex > toIndex)
}
```

1.Да се реализира **DoublyLinkedList** - *линеен двусвързан списък с елементи от тип* ***Object***, съгласно спецификацията:

```
public class DoublyLinkedList implements List {
        //Представяне
        private DNode head,tail;
        private int num;

        //Методи за достъп
        public DNode getHead() { return head; }
        public void setHead(DNode p) { head = p; }
        public DNode getTail() { return tail; }
        public void setTail(DNode p) { tail = p; }
        public void setNum(int n) { num = n; }
        public int getNum() { return num; }

        //Конструктор, който създава празен списък
        public DoublyLinkedList(){
                setHead(new DNode());
                setTail(new DNode());
                getTail().setLeft(head);
                getHead().setRight(tail);
                num = 0;
        }

        //Собствен метод, който връща указател към възела с индекс index на текущия списък
        private DNode search(int index) throws IndexOutOfBoundsException {
                if(index < 0 || index >= size()) throw new IndexOutOfBoundsException();
                DNode p = getHead().getRight();
                for(int i = 0; i < index; i++) p = p.getRight();
                return p;
        }

        //Реализация на методите на интерфейса List
        //…
        public Iterator iterator() { return new DoublyLinkedListIterator(this); }

        //Друг метод
        public Iterator reverseIterator() { return new DoublyLinkedListReverseIterator(this); }
}
```

Класът **DNode** представя *възел на линеен двусвързан списък*:

```
public class DNode {
         //Data
```

```
	private Object data;
	private DNode left,right;

	//Constructors
	public DNode() { data = left = right = null; }
	public DNode(Object d) { data = d; left = right = null; }

	//Methods
	public DNode getLeft() { return left; }
	public void setLeft(DNode l) { left = l; }
	public DNode getRight() { return right; }
	public void setRight(DNode r) { right = r; }
	public Object getData() { return data; }
	public void setData(Object d) { data = d; }
}
```

Класът **DoublyLinkedListIterator** представя итератор за обхождане на списък от първия към последния му елемент:

```
public class DoublyLinkedListIterator implements java.util.Iterator {
	//Data
	DoublyLinkedList list;
	DNode current;

	//Constructor
	public DoublyLinkedListIterator(DoublyLinkedList list) {
		this.list = list;
		current = list.getHead();
	}

	//Methods
	public boolean hasNext() {return current.getRight() != list.getTail();  }
	public Object next(){
		if(hasNext()){
			current = current.getRight();
			return current.getData();
		}
		throw new java.util.NoSuchElementException();
	}
	public void remove() { throw new UnsupportedOperationException(); }
	public void reset() { current = list.getHead(); }
}
```

Класът **DoublyLinkedListReverseIterator** представя итератор за обхождане на списък от последния към първия му елемент:

```
public class DoublyLinkedListReverseIterator implements java.util.Iterator {
	//Data
	DoublyLinkedList list;
	DNode current;

	//Constructor
	public DoublyLinkedListReverseIterator(DoublyLinkedList list) {
		this.list = list;
		current = list.getTail();
	}

	//Methods
	public boolean hasNext() {return current.getLeft() != list.getHead();  }
	public Object next(){
		if(hasNext()){
			current = current.getLeft();
			return current.getData();
```

```
                }
                throw new java.util.NoSuchElementException();
        }
        public void remove() { throw new UnsupportedOperationException(); }
        public void reset() { current = list.getTail(); }
}
```

2.Да се реализира клас **FancyDoublyLinkedList**, съгласно спецификацията:

```
public class FancyDoublyLinkedList extends DoublyLinkedList implements List, FancyList, FancyCollection {
        //Конструктор
        public FancyDoublyLinkedList() {...} //Създава празен списък

        //Наследяване на методите на интерфейса List, реализирани в класа DoublyLinkedList
        //Реализация на методите на интерфейса FancyList
        // Реализация на методите на интерфейса FancyCollection
}
```