WIA1002/WIB1002 Data Structures

Lab: Linked List/Doubly LinkedList

Q1

Create a package called SList and implement a node class called SNode<E>. The SNode<E> class consists of two constructors, respectively, a default constructor and a constructor that receives a generic item.

1) Initialise the variables appropriately in each constructor.

2) Create a generic class called `SList<E>` and include the necessary declaration in the `SList<E>` class.

3) Implement the following methods in class `SList<E>`:

   i. `public void appendEnd(E e)`
   Append a new element at the end of the list.

   ii. `public E removeInitial()`
   Eliminate the first element in the list.

   iii. `public boolean contains(E e)`
   Search for an element and returns true if this list contains the searched element

   iv. `public void clear()`
   Empty all elements in the list and return a statement that reports that the list is empty.

   v. `public void display()`
   Display all values from the list in a successive order.

4) Write a test program called `TestSList` in the `SList` package. Using the appropriate methods you implemented in `SList<E>`, do the following:

   1) Append the following values individually: “Linked list, is, easy.”
   2) Display these values.
   3) Remove the word “Linked list” and display the removed value.
   4) Check if ‘difficult’ is in the list.
   5) Clear the list.

Q2

A kindergarten needs to use an online student management system enabling its admin staff to manage their student list. Write a program using singly linked list to demonstrate the following:

i) public void add(E e)
ii) public void removeElement(E e)
iii) public void printList()
iv) public int getSize()
v) public boolean contains(E e)
vi) public void replace(E e, E newE)

The program should demonstrate the following functions:

- Admin staff shall be able to interact with the program. The admin staff should enter a list of student's names.
- Display the list of the entered student's names.
- Calculate the number of students in the list.
- Rename existing student's name in the list with the new one specified by the admin staff.
- Delete a student name as specified by the admin staff.

Sample Output

```
Enter your student name list. Enter 'n' to end.....
Rahmat
Alice
Fatymah
Yoke Ling
Maniam
Abu
n

You have entered the following students' name :
Rahmat, Alice, Fatymah, Yoke Ling, Maniam, Abu.

The number of students entered is : 6

All the names entered are correct? Enter 'r' ro rename the student name, 'n' to proceed.
r

Enter the existing student name that u want to rename :
Fatymah

Enter the new name :
Fatimah

The new student list is :
Rahmat, Alice, Fatimah, Yoke Ling, Maniam, Abu.

Do you want to remove any of your student name? Enter 'y' for yes, 'n' to proceed.
y

Enter a student name to remove :
Maniam

The number of updated student is :5
The updated students list is :
Rahmat, Alice, Fatimah, Yoke Ling, Abu.

All student data captured complete. Thank you!
```

Q3

1) Implement all the DoublyLinked List methods in the lecture's slide. Write a test program by using the appropriate methods, do the following:

    1) Add first node with value of 1
    2) Add last node with value of 100
    3) Add node with value of 2 at position index of 2
    4) Remove node at position index of 3
    5) Traverse Forward
    6) Traverse Backward
    7) Print current size of linked list
    8) Clear all nodes in the linked list
    9) Print again current size of linked list

Sample Output:

```
adding: 1
adding: 10
adding: 100
deleted: 100

iterating forward..
1 10 2
iterating backward..
2 10 1
size of current Doubly Linked List: 3
successfully clear 3 node(s)

size of current Doubly Linked List: 0
```