

Class Exercise on Linked Lists

Set A

1. Write a program to create a singly linked list of n nodes and perform:

- **Insertion**
 - At the beginning
 - At the end
 - At a specific location
- **Deletion**
 - At the beginning
 - At the end
 - At a specific location

Definition of Done:

- a) The program should ask user to enter the size and elements of the linked list
- b) The program should display the choices to perform every operation
- c) The program should also display the linked list status after every operation as desired

2. Write a program to perform the following set of operations on a singly linked list (SLL):

- Swapping the first and last node of a singly linked list
- Pairwise swap elements of a given linked list
- Get the location of first and last occurrence of an element in a single LinkedList
- Remove duplicates from an unsorted linked list
- Delete alternate nodes of a Linked List

Defining of Done:

- a) Program should ask the user to enter the size and elements of the linked list
- b) It should display the output line by line as asked in the question
- c) Finally, should ask the user to continue (Y) or quit (N)

3. Write a program to check whether the given linked lists are identical or not. It should contain a static function *findIdentical()* which returns TRUE if the lists are identical and FALSE otherwise.

Example: if the two lists were:

1 -> 2 -> 3 -> 4 -> 5 -> X

1 -> 2 -> 3 -> 4 -> 5 -> X

findIdentical() should return true, because the list have same values in each position.

Definition of Done:

- a) The program should ask user to enter the size and elements of both the linked lists
- b) It should finally return TRUE/FALSE based on the element positions

4. Write a program to check whether the given linked list is palindrome or not.

Example: Consider the given linked list:

$R \rightarrow A \rightarrow D \rightarrow A \rightarrow R$, is a palindrome

Definition of Done:

- a) The program should ask user to enter the size and elements of the linked list
- b) It should finally display whether the given LL is palindrome or not

5. Write a program to reverse the linked list in pairs.

If you have a linked list that holds $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5$, then after the function has been called the linked list would hold $2 \rightarrow 1 \rightarrow 4 \rightarrow 3 \rightarrow 5$

Definition of Done:

- a) The program should ask user to enter the size and elements of the linked list
- b) The program should display the desired result

Set B

6. Write a function that, given an integer n , converts n to binary and stores each bit in one node of a linked list with the least significant bit at the head of the list and the most significant bit at the tail.
For example, given `13`, the bits are stored in the order 1 0 1 1, from head to tail.

Definition of Done:

- a) The program should ask the user to enter only integer value (without decimal) and prompts the user to enter again in case if it's a String/floating value
- b) It should display the binary representation of the given integer value as desired

7. Given two lists, create a static method *shuffleMerge()* to merge their nodes together to make one list, taking nodes alternately between the two lists.

So *shuffleMerge()* with $\{1, 2, 3\}$ and $\{7, 13, 1\}$ should yield $\{1, 7, 2, 13, 3, 1\}$. If either list runs out of elements, all the nodes should be taken from the other list.

Definition of Done:

- a) The program should ask user to enter the size and elements of both the linked list
- b) It should return a single linked list containing all the elements merged alternatively

8. Write a program to create a doubly linked list (DLL) of n nodes, and perform the following:

- **Insertion**
 - At the beginning
 - At the end
 - At a specific location
- **Deletion**
 - At the beginning
 - At the end
 - At a specific location
- **Traversal**
 - Forward
 - Reverse

Definition of Done

- a) The program should ask user to enter the size and elements of the linked list.
- b) The program should display a menu with the above choices and ask the user to choose one of the choices.
- c) The program should display the desired result

9. Write a program to rotate a doubly linked list (DLL) by a N nodes in a counter-clockwise direction.

Example: consider the given linked list

$A \rightarrow B \rightarrow C \rightarrow D \rightarrow E \rightarrow F \rightarrow G \rightarrow H$

Rotate by 4th Node

$E \rightarrow F \rightarrow G \rightarrow H \rightarrow A \rightarrow B \rightarrow C \rightarrow D$

Definition of Done:

- a) The program should ask the user to enter the elements into a DLL and rotate position
- b) The value of N should be less than length of the list
- c) Finally, it should display the desired result

10. Write a program to create a Circular Linked List (CLL) of n nodes, and perform the following:

- **Insertion**
 - At a specific location
- **Deletion**
 - At a specific location

Definition of Done

- a) The program should ask user to enter the size and elements of the linked list.

- b) The program should display a menu with the above choices and ask the user to choose one of the choices.
- c) The program should display the desired result.

Set C

11. Write a program to rearrange a given linked list such that it consists of alternating minimum & maximum elements. The first element of the list should be minimum, and second element should be maximum of all elements present in the list. Similarly, third element will be next minimum element and fourth element is next maximum element and so on. Use of extra space is not permitted.

Example:

Input: [1 3 8 2 7 5 6 4]

Output: [1 8 2 7 3 6 4 5]

Definition of Done:

- a) The program should ask the user to enter the size and elements of the linked list
- b) The program should not use any extra space for its operations
- c) It should display the desired result

12. n children (numbered 1 to n) are arranged in a circle. An integer value 'm' is used to eliminate one child at a time until only a single child is left. Starting at child 1, the children are counted from 1 to m and the mth child is eliminated. Starting with the child after the one just eliminated, the children are again counted from 1 to m and the mth child is eliminated. This is repeated until one child is left. Counting is done circularly, and eliminated children are not counted.

Write a program to read values for n and m (> 0), play the game as described, and print the number of the last remaining child.

Example:

Enter number of children and length of count-out: 4, 5

The winning child is: 2

Definition of Done:

- a) The program should ask the user to enter the number of children and length of count-out
- b) It should display the number of last remaining child