Home Work

CS221: Data Structures and Algorithms

Usman Institute of Technology

Fall 2018

Linked List

Q 1) Describe a situation where storing items in an array is clearly better than storing items on a linked list.

Q 2) What are the advantages of using linked-list over array?

Q 3) Write code to insert a node in double linked list after specific element. For example, we want to add “45” after “99”. The signature of your code must look like:

void Insert(int newElement, int elementAfter)

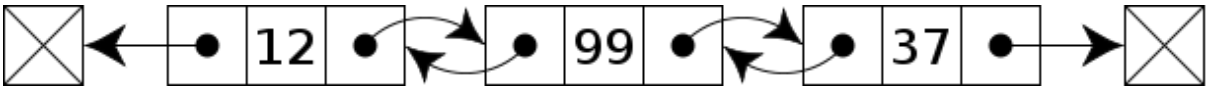

Figure 1: Double Linked List (Wikipedia)

Q 4) What are the steps to inserting a new item at the head of a linked list? Use one short English sentence for each step.

Q 5) Write a method SecondLast() for **singly linked list** that returns the second last element of the list. Can we implement this method in O(1)?

Q 6) Write a method SecondLast() for **doubly linked list** that returns the second last element of the list. Can we implement this method in O(1)?

Q 7) Design and implement reverse() method for **singly linked list** that reverses the order of elements in a single linked list. This method should run in O(n) time, should not use recursion, should not use any secondary data structures, and should not create any new nodes.

Q 8) We have to create a phonebook application for mobile. We know due to limited storage in mobile phones, we cannot use array to store data. Therefore, we decided to use linked-list structure in order to store data. Can you write node class for this? You need to write just class members (properties and functions)

```
clas PhonebookNode
 {
       // your code will go here;
}
```

Q 9) Write a method in order to merge two singly linked lists. Also analyze the complexity of your method in terms of Big-O.

```
       public void Merge(Node root1, Node root2)
 {
              // Your code will go here
```

}

Q 10) According to legend, the first century Jewish historian, Flavius Josephus, was captured along with a band of 40 compatriots by Roman soldiers during the Jewish–Roman war. The captured soldiers decided that they preferred suicide to being captured and devised a plan for their demise. They were to form a circle and kill every third soldier until they were all dead. Joseph and one other decided they wanted no part of this and quickly calculated where they needed to place themselves in the circle so that they would both survive. Write a program that allows you to place n people in a circle and specify that every m person will be killed. The program should determine the number of the last person left in the circle. Use a circularly linked list to solve the problem.

Q 11) Design and implement a ToArray method for the LinkedList class that takes a linked list instance and returns an array.

Q 12) Attempt following questions from the text book:

I. 10.2-2
II. 10.2.-3
III. 10.2-6
IV. 10.2-7