Data Structures and Algorithms – Assignment 2

Linked List Applications

1. Write a Java program to remove duplicates from an unsorted linked list.
2. Write a Java program to implement an algorithm to find the k^{th} to the last element of a singly linked list.
3. Write a Java program to detect if a linked list has a loop in it.
4. Given a singly linked list, find middle of the linked list. For example, if linked list is **1->2->3->4->5** then output should be **3**. If there are even nodes, then there would be two middle nodes, we need to print second middle element.
   For example, if given linked list is **1->2->3->4->5->6** then output should be **4.**
5. Given a linked list check whether it is a palindrome or not? Which linked list is best suitable for this application?
6. Merge two sorted linked lists and return it as a new list. The new list should be made by splicing together the nodes of the first two lists.
   Example:
   Input: 1->2->4 and 1->3->4
   Output: 1->1->2->3->4->4
7. You are given two non-empty linked lists representing two non-negative integers. The digits are stored in reverse order and each of their nodes contain a single digit. Add the two numbers and return it as a linked list. You may assume the two numbers do not contain any leading zero, except the number 0 itself.
   Example:
   Input: (2 -> 4 -> 3) + (5 -> 6 -> 4)
   Output: 7 -> 0 -> 8
   Explanation: 342 + 465 = 807.
8. Write a java class to maintain a personal contact list. Each contact should have name and mobile number. Your program should be able to process several commands as explained below:
   a. All contacts will be maintained in a sorted order by the name.
   b. Users should be able to delete the contact by specifying the name.
9. Ramu, had a set of Goats identified by 1,2,3... arranged In some random order He is asked to kill one goat on each customer request. He is too confused and is unable to choose the goat to be killed first. Finally he has decided to choose fourth goat on each request. He will count the goats in one direction (left to right) and kill the fourth goat and then on next request he will start counting from the hen next to the killed one. Once the set of goat is exhausted he will change the direction (right to left) and continue the process.

Choose the best data structure and simulate the delete function.

Example:

List of goats: 21, 4, 7, 3, 8, 9, 12, 18, 3, 27

After customer 1: 21, 4, 7, 8, 9, 12, 18, 3, 27

After customer 2: 21, 4, 7, 8, 9, 12, 3, 27

After customer 3: 21, 4, 7, 8, 9, 12, 27

After customer 4: 21, 4, 8, 9, 12, 27

After customer 5: 21, 8, 9, 12, 27