Assignment-01(Marks 25)

1. Your task is to implement functions for the following tasks in a singly linked list. You can use the code of the single linked list provided as a template in your class.

   1. Insert into mid position: This function will take an integer value and insert it in the middle of a linked list. You will have to count the number of elements in a LL to calculate the mid position.

   2. Add all elements of an array at the end of the LL: You will be given an array of integers. Your task is to add all the elements of the array at the end of the linked list.

   3. Delete k-th element of a LL: The user will provide the value of k. Your task is to delete the k-th element from the LL. You can traverse the whole LL only once.

   4. Replace the last element of a LL using the sum of the LL: Your task is to calculate the sum of all the elements in the LL and replace the last element of the LL by the value of the sum.

   5. Search all the even numbers of a LL: Your task is to traverse the LL and look for the even numbers and put them in an array.

2. The Stack will be implemented using **Linked List**. Your code will have the following functions:

   i) int pop() : Pops and returns the top element of the stack, the element is removed from the stack

   ii) void push(int elem) : Insert the given element inside the stack

   iii) int isEmpty() : Return 1 if the Stack is empty, return 0 if the Stack is not empty

   iv) int peek() : Return the top element without removing it from the Stack

   v) void display() : Print all the elements of the Stack

   vi) void sort() :Add a function to sort the stack in ascending order (with biggest items on top) using only push, pop, peek operations.

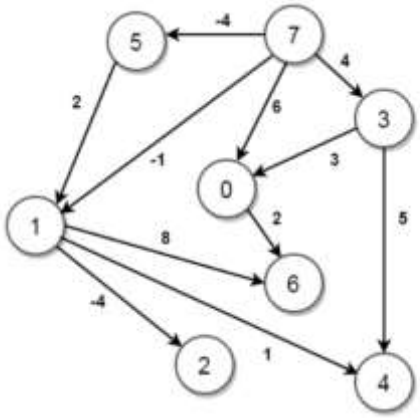
3. Implement a priority queue using linked list. Your code will have the following functions:

   1. Put(int val): It adds the value 'val' in such a manner that the list will be sorted in ascending order after each 'put' operation.
   2. int pop(): it returns and delete the top item in the list.

4. Write a program to show the vertex with the highest number of adjacent nodes in an undirected graph. The first two lines of the input will contain v (vertices) and e (edges). The next e number of lines contains the list of edges. You have to create the Adjacency Matrix first then do the rest of the code.

Sample Input	Sample Output
10 12 0 5 0 2 0 1 1 4 1 3 2 5 3 7 4 9 4 8 5 6 8 9 4 3	4
5 6 0 3 0 2 0 1 0 4 1 2 2 4	4

5. Find the cost of the longest path from the source vertex to all other vertices in the graph, given a weighted directed acyclic graph (DAG) and a source vertex. If the vertices are inaccessible from the supplied source vertex, their distance is displayed as infinity.
For example, consider the following DAG,



The longest distance of source vertex 7 to every other vertex is:
dist(7, 0) = 7 (7 —> 3 —> 0)
dist(7, 1) = -1 (7 —> 1)
dist(7, 2) = -5 (7 —> 1 —> 2)
dist(7, 3) = 4 (7 —> 3)
dist(7, 4) = 9 (7 —> 3 —> 4)
dist(7, 5) = -4 (7 —> 5)
dist(7, 6) = 9 (7 —> 3 —> 0 —> 6)

6 Carbon Ltd. company is storing their employee details using a linked list.The employees have [name, id, position]. Here each consecutive employee has connection to each other. Return the number of connected employees in number, where two entity are connected if they appear consecutively in the linked list.

Input	Output
Rana, 11023, Software-Tester Salman, 12045, Designer Jacob, 21055, FrontEnd-Developer Rasel, 22134, BackEnd-Developer [Rana, Jacob, Rasel]	1 (Jacob, Rasel)
Rana, 11023, Software-Tester Salman, 12045, Designer Jacob, 21055, FrontEnd-Developer Rasel, 22134, BackEnd-Developer Patrick, 31022, Administrator [Rana, Rasel, Salman, Patrick]	2 (Rana, Salman and Rasel, Patrick)

7 Write a program which will take an integer N (0<N<1000) from the user. Generate N random numbers (range: 1-100) and store them into queue. Now write a function which will print the value that occurred most of the time. If multiple values occurred maximum time, then print all the values with number of occurrence.

input	output
N = 5 Random values: 12 8 25 9 25	25 occurred 2 times

N = 7 Random values: 25 8 25 9 25 9 9	9, 25 occurred 3 times

8 Carbon Ltd. company now wants to design a stack that supports push, pop, top, and retrieving the employee with minimum work-hour in constant time.
Implement the **MinStack** class:
declare an employee obj named **Emp** where each employee has **[name, id, work-hour]**
MinStack() initializes the stack object.
void push(Emp employee) pushes the object employee onto the stack.
void pop() removes the employee on the top of the stack.
int top() gets the top employee of the stack.
int getMin() retrieves the employee detail who has the least work-hour time in the stack.

input	output
N = 3 Rasel, 014, 45 Yaseer, 023, 55 Naheed, 033, 12	

Instructions:

1. You will get zero, if there are any plagiarism.
2. Submit eight .cpp files for eight problems in a single zip file.