Birla Institute of Technology and Science, Pilani Hyd Campus

BITS F232: Foundations of Data Structures and Algorithms

1st Semester 2023-24: Assignment 1 (Set A)

Maximum marks: 20 Date of Submission: 8th Nov 2023

Q.1 Refer to the given file named 1.1 (part C++ code). Implement a stack using 2 queues. You can use the queue in STL for the same. Using the stack implementation above, create a class EnhancedStack, which returns the minimum element present in the stack in O(1) time. Complete the function sortStack() given in the file, to sort a stack only using another stack object, and no additional data structures. Return the sorted stack. Sample runs are shown below:

```
Pushed element: 3 to stack
Pushed element: 1 to stack
Pushed element: 4 to stack
Pushed element: 2 to stack
Original Stack: 2 4 1 3
Top Element: 2
Minimum Element: 1
```

```
Pushed element: 5 to stack
Pushed element: 1 to stack
Pushed element: 3 to stack
Pushed element: 2 to stack
Pushed element: 4 to stack
Original Stack: 4 2 3 1 5
Sorted Stack: 5 4 3 2 1
```

[10 Marks]

Q. 2 You are tasked with implementing a program that performs binary addition using linked lists. The program should take two decimal numbers as input, convert them into binary representations in form of strings, form linked lists for each binary number, add these linked lists to create a new linked list representing the binary sum, and then convert this linked list back to a decimal number for output.

INPUT FORMAT (input arrives from the terminal / stdin):

Two decimal numbers, num1 and num2, where (0 <= num1, num2 <= 10^5).

OUTPUT FORMAT (print output to the terminal / stdout):

First Two Lines should be binary representation of the numbers in form of strings

Next two Lines should be the traversal of linked list from LSB to MSB of binary representation.

Next line should be the traversal of linked list from LSB to MSB.

Last line should be single decimal number representation of the sum linked list.

SAMPLE INPUT 1:

32

17

SAMPLE OUTPUT 1:

49

Explanation For first test case:

- Convert **num1** (32) and **num2** (17) to binary:
- Binary representation of 32: “100000”
- Binary representation of 17: “10001”
- Form linked lists for the binary representations (here taken from LSB to MSB by making Linked list out of reverse of string):
- Linked list for 000001: 0 -> 0 -> 0 -> 0 -> 0 -> 1
- Linked list for 10001: 1 -> 0 -> 0 -> 0 -> 1
- Add the linked lists to obtain the result linked list: (again from LSB to MSB)
- Result linked list: 1 -> 0 -> 0 -> 0 -> 1 -> 1 (represents binary 100011) (from LSB to MSB)
- Convert the result linked list back to decimal: 49.

(Note: May use part program given in file named as 1.2)

[10 Marks]
