

Lab Assignment 4: Stack and Queue

Instructions:

1. Unless not specified, on a queue only enqueue () and dequeue() operations can be done. Similarly, on a Stack only Push() and Pop() operations can be done.
2. For singly linked list follow the same structure of the node as discussed in the class.
3. All the values has to be taken from user. For example, size of array or linked list or stack or queue, elements of the stack or queue.

Deadline: 30th October 2020

1. Write a program to implement a Stack using array. In order to implement the stack, program for following stack operations has to be written:

- void push(int): to insert data onto the stack.
- Int pop(): to remove and return the last inserted element from the stack.
- Int top(): Returns the last inserted element without removing it.
- int Size(): Returns the number of elements stored in the stack.
- int IsEmptyStack(): Indicates whether any elements are stored in the stack or not.
- int IsFullStack(): Indicates whether the stack is full or not.

2. Implement the stack using linked list. Repeat the stack operations mentioned in Question 1.

3. Write a program to convert an infix expression to postfix. Here, input should be a string and output should also be a string. For example, if input is "(A+B)*(A-B)" then output will be "AB+AB-*". You have to use only following operators: +, -, *, / and parenthesis as ().

4. Write a program to evaluate a postfix expression-using stack. Here, input will be a string but output will be a numeric value such as integers, float etc. For example, if the postfix expression (as input) is "123*+5-" then output will be 2. You have to use only following operators: +, -, *, / in the postfix expression.

5. Given an array of characters formed with a's and b's. The string is marked with special character X which represents the middle of the list (for example: ababa...ababXbabab baaa). Check whether the string is palindrome or not using stack.

6. Write a program to implement Queue using circular array.

7. Write a program to implement Queue using linked list.

8. Write a program to implement Queue using two stacks.

9. Write a program to implement Stack using two queues.

10. Given an integer k and a queue of integers, how do you reverse the order of the first k elements of the queue, leaving the other elements in the same relative order? For example, if $k=4$ and queue has the elements [10, 20, 30, 40, 50, 60, 70, 80, 90]; the output should be [40, 30, 20, 10, 50, 60, 70, 80, 90]. Here, you can use an auxiliary stack.