Department of Electrical & Computer Engineering (ECE)
Concordia University

Data Structure

COEN 352: Summer '24

Assignment 1: (due date: May 23rd @ 23hr55, via Moodle)

Questions

1) Design and build your own queue data structure, using a singly-linked list, such that it supports following operations:

   getmin(): returns the minimum elements of the queue (currently present, deleted ones are not taken into account).
   enque(element): adds an element "element" in the queue.
   deque(): removes the first element present from the queue.

   For example (only consider integers):

   Input:
   enque(2)
   enque(4)
   getmin() -------> output: returns 2 as it is the current minimum
   enque(-1)
   getmin() -------> output: returns -1 as now it is the minimum element.

2) Given a string, write your own program (without using existing data structure libraries) that uses stacks to examine whether the pairs and the orders of "{", "}", "(", ")", "[", "]" are correct in the given expression.

   For example:

   Input: [()]{}{[()()]()}
   Output: Balanced

   Input: [(])
   Output: Not Balanced

Recommended practice problems in textbook (do not need to submit)

1.3.3, 1.3.9, 1.3.13, 1.3.15 (see below).

1.3.3 Suppose that a client performs an intermixed sequence of (stack) *push* and *pop* operations. The push operations put the integers 0 through 9 in order onto the stack; the pop operations print out the return values. Which of the following sequence(s) could *not* occur?

a. 4 3 2 1 0 9 8 7 6 5
b. 4 6 8 7 5 3 2 9 0 1
c. 2 5 6 7 4 8 9 3 1 0
d. 4 3 2 1 0 5 6 7 8 9
e. 1 2 3 4 5 6 9 8 7 0
f. 0 4 6 5 3 8 1 7 2 9
g. 1 4 7 9 8 6 5 3 0 2
h. 2 1 4 3 6 5 8 7 9 0

1.3.9 Write a program that takes from standard input an expression without left parentheses and prints the equivalent infix expression with the parentheses inserted. For example, given the input:

```
1 + 2 ) * 3 - 4 ) * 5 - 6 ) ) )
```

your program should print

```
( ( 1 + 2 ) * ( ( 3 - 4 ) * ( 5 - 6 ) )
```

1.3.13 Suppose that a client performs an intermixed sequence of (queue) *enqueue* and *dequeue* operations. The enqueue operations put the integers 0 through 9 in order onto the queue; the dequeue operations print out the return value. Which of the following sequence(s) could *not* occur?

a. 0 1 2 3 4 5 6 7 8 9
b. 4 6 8 7 5 3 2 9 0 1
c. 2 5 6 7 4 8 9 3 1 0
d. 4 3 2 1 0 5 6 7 8 9

1.3.15 Write a `Queue` client that takes a command-line argument `k` and prints the `k`th from the last string found on standard input (assuming that standard input has `k` or more strings).

Submission

You must submit a ZIP file that includes all your programs. Name you ZIP file exactly "Assignment1". ONLY SUBMIT ONE ZIP FILE PER TEAM.

The program must be in Java. The programs need to be titled exactly as "Ass1_Q1" and "Ass1_Q2". I will run your code using 10 random inputs, each correct output will be marked as 10% (100% if your program works with all 10 inputs). Also, place the names and IDs of all team members (maximum 2 people per team) on the first line of each file (commented). A team only needs one submission and team members will share the same grades. If you want to be marked separately, put only your name and ID in your program and submit separately.

Include all your .java files in a folder called "Ass1Java".