Data Structures and Algorithms

Lab Journal - Lab 2

Name: _____

Enrollment #: _____

Class/Section: _____

Objective

This lab is intended to introduce students to Stacks and their applications. The students will implement the Stack and employ it in solving the given problems.

Task 1 :

Give answers to the following.

<table>
<tr><td>1.</td><td>Show the contents of stack (at each step) once the following sequence of statements is executed.
<pre>Stack S;</pre>
<table>
<tr><td><pre>1. S.Push('A');</pre></td><td></td></tr>
<tr><td><pre>2. S.Push('B');</pre></td><td></td></tr>
<tr><td><pre>3. S.Push('C');</pre></td><td></td></tr>
<tr><td><pre>4. S.Pop();</pre></td><td></td></tr>
<tr><td><pre>5. S.Pop();</pre></td><td></td></tr>
<tr><td><pre>6. S.Push('D');</pre></td><td></td></tr>
<tr><td><pre>7. S.Push('E');</pre></td><td></td></tr>
<tr><td><pre>8. S.Pop();</pre></td><td></td></tr>
<tr><td><pre>9. S.Pop();</pre></td><td></td></tr>
</table></td></tr>
<tr><td>2.</td><td>Convert (manually) the following expressions to postfix.
(A+B*D)/(E-F)+G : _____</td></tr>
</table>

A*(B+D)/E-F*(G+H/K) :_____

3. Convert the following infix expressions to prefix.

A*B +(C/E) – (F+G) : _____

A+(B-D)/E-F*(G*H+K) :_____

4. Evaluate the given Postfix expression and trace the contents of the Stack at each step using the standard evaluation algorithm.

2 7 3 - / 2 1 5 + * +

Symbol	**Stack Contents**
2	
7	
3	
-	
/	
2	
1	
5	
+	
*****	
+	

Result : _____

5. Convert the following expression from infix to postfix and show the contents of Stack and the output expression at each step.
(A+B) * C – D+F*G

Symbol	Stack Contents	Output Expression
(	(	
A	(	
+	+	
B	+	
)		
*	*	
C	*	
-	-	
D	-	
+	+	
F	+	
*	+	
G		

Task 2 :

Implement the Stack class and employ it to solve the given exercises.

Exercise 1

Write a C++ program that prompts user to enter a number (in decimal). Convert the number into binary and display the binary number using the Stack.

Exercise 2

Write a program that reads a string (an array of characters) from a text file. Reverse the string using the Stack and write the reversed string to another text file.

Exercise 3

Write a function that reads a Mathematical expression from a text file and verifies the validity of paranthesis in the expression using a Stack.

Exercise 4

Implement a program to read a postfix expression from a text file, evaluate the expression using a Stack and display the result. The text file should contain expressions in the form as illustrated in the following. (For simplicitiy, assume single digit numbers in the expression.) 23+5*6+

Implement the given exercises and get them checked by your instructor. If you are unable to complete the tasks in the lab session, deposit this journal alongwith your programs (printed or handwritten) before the start of the next lab session.

S No.	Exercise	Checked By:
1.	Exercise 1	
2.	Exercise 2	
3.	Exercise 3	
4.	Exercise 4	

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